Americas

Fish Acoustics Tracking Study Project-Specific HASP Addendum

Location: Portland Harbor (Fish Acoustics Tracking Study)
Date: April 16, 2018
Prepared By: Linda Howard, Glen Mejia, Ryan McCarthy
Approved By:

Brief Summary of Fish Acoustics Tracking Study
A fish tracking study will be performed to characterize the movement and home range of smallmouth bass (SMB) within the study area. The design will consist of a series of gates and arrays of acoustic receivers mounted on fixed moorings placed on the river bottom. The receivers will capture movement of SMB that have been implanted with acoustic tags.

Ballard Marine will provide vessel support to install the receivers. HTI-Vemco will support receiver deployment and tag implantation. Fish collection will be performed using rod and reel/hook and line, with support from the Oregon Bass and Panfish Club. A total of 40 tagged SMB are targeted for collection and tagging. Surgical tag implantation will be performed by experienced HTI-Vemco field biologists with assistance from AECOM biologists at a secure on-shore location. It is assumed that receiver deployment and fish collection/tag implant will take 2 to 3 weeks.

Team Leads and Supervisors

Organization	Job Title/Role	Name	Cell Phone
AECOM	Fish Tracking Task Lead/ Site Safety Officer	Ryan McCarthy	(b) (6)
AECOM	Project Field Coordinator Site Safety Officer	Nicky Moody	
AECOM	Project Manager Biotic Field Coordinator	Jenny Pretare	
Geosyntec	Project Field Coordinator	Keith Kroeger	
Ballard Marine (Deployment of receivers)	Ballard Marine Project Manager	Robert Stanton	
Gravity (Fish collection)	Gravity Project Manager	Shawn Hinz	
HTI-Vemco	Acoustic Tag Specialist	Sam Johnston	
U.S. Army Corps of Engineers	Senior Aquatic Biologist	Christa Woodley	

Supplemental List of Personnel, Short-Service Employees, Subcontractors and their Safety Officers
(*from Programmatic HASP Summary: the Project-Specific HASPs will list all short-service employees, including subcontractors that are scheduled to participate in Project activities*)

Organization	Job Title/Role	Name	Cell Phone	SSEs and Safety Officers
AECOM	Project Field Coordinator/Site Safety Officer	Nicky Moody	(b) (6)	Safety Officer
AECOM	Fisheries ESA Biologist	Steve Pagliughi		Alternate SSO
AECOM	Fisheries ESA Biologist	Andy Clodfelter		Alternate SSO
Gravity	Gravity Project Manager	Shawn Hinz		Safety Officer
Gravity	Captain	Mike Duffield		
Gravity	Captain	Rene Trudeau		
Gravity	Captain	Peter Jenkins		
Gravity	Captain	John Schaefer		
Gravity	Deckhands/Scientist	Jeff Wilson		
Gravity	Deckhands/Scientist	Jeff Schut		
Gravity	Deckhands/Scientist	Chad Furulie		
Gravity	Deckhands/Scientist	Edward Sloan		
Ballard Marine	Captain	Alex Anderson		Safety Officer
HTI-Vemco	Acoustic Tag Specialist	Sam Johnston		Safety Officer
U.S. Army Corps of Engineers	Senior Aquatic Biologist	Christa Woodley		Safety Officer

Supplemental List of Hazard Materials
(*from Section 3.7 Hazard Communications: Hazardous materials that may be encountered as existing environmental or physical/health contaminants will be addressed in the Project-Specific HASPs that will be appended to this Programmatic HASP, The Supervisor or Safety Officer will maintain copies of all SDS on-site and in Project-Specific HASPs appended to this HASP. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable*)

Hazardous Material
Nolvasan
Alconox

Supplemental List of Competent Persons

(*from Section 5.3.1 Competent Persons*: *To be identified in the Project-Specific HASP Addendum*)

Operations	Organization	Job Title/Role	Name	Cell Phone
Safe Vessel Operations	Ballard Marine	Captain	Alex Anderson	(b) (6)
Safe Vessel Operations	Gravity	Captain	Mike Duffield	
Safe Vessel Operations	Gravity	Captain	Rene Trudeau	
Safe Vessel Operations	Gravity	Captain	Peter Jenkins	
Safe Vessel Operations	Gravity	Captain	John Schaefer	

Supplemental List of CPR/First Aid Trained Personnel

(*from Section 12.4 CPR/First Aid Trained Personnel: CPR/First Aid Trained Personnel that will be on-site will be identified in the Project-Specific HASPs for each study*)

Organization	Job Title/Role	Name	Cell Phone	Training
AECOM	Site Safety Officer Project Field Coordinator	Nicky Moody	(b) (6)	CPR, First Aid, and AED
AECOM	Field Lead	Ryan McCarthy		CPR, First Aid, and AED

HASP Addendum Attachments:

Attachment 1. AECOM Pre-Job Hazard Assessment
Attachment 2. Gravity Health and Safety and Environmental Plan
Attachment 3. Ballard Marine Activity Hazard Analysis Form and Vessel Diagram
Attachment 4. Gravity Vessel Diagrams
Attachment 5. Safety Data Sheets
Attachment 6. Portable Electronarcosis System (Hudson et al. 2011)
Attachment 7. Lift Classification
Attachment 8. Subcontractor's Annual Crane Inspection
Attachment 9. Daily Crane Inspection
Attachment 10. Monthly Rigging Inspection
Attachment 11. AECOM SH&E Procedure S3NA 310-PR-1 Cranes and Lifting Devices
Attachment 12. Electronarcosis Safety Inspection Form

Attachment 1: Pre-Job Hazard Assessment

S3AM-209-FM4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify engineering and administrative controls and any specific Personal Protective Equipment (PPE) that is required	
ACTIVITY 1 – Mobilize personnel and equipment to study area.	Traffic/driving hazards	10	• All AECOM drivers must have current driver awareness training (available on AECOM University) • All drivers must have current, valid driver's license on their person. • Complete pre-use visual inspection. Wa k around the vehicle to inspect for potential hazards or mechanical issues before driving. • Practice defensive driving and drive in a courteous manner. • Seat belts must be worn by the driver and all passengers. • Obey all speed limits. • Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. • Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. • Travel with headlights on at all times. • Travel during daylight hours when possible. • Equip vehicles with first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. • The project goal is to limit activities to no more than 10 hours/day; contact project manager if work days extend beyond the 10 hours.	5
	Fatigue	12	• Extended workdays can be granted; however, workdays shall not exceed 14 hours and extended work weeks, 60 hours/week. • For emergency work, a single shift should be limited to 16 hours, and an employee should be off work for at least 12 hours before the next shift starts. If shift work is required, employees should be given sufficient time	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			to get a continuous 7- to 8-hour period of sleep in each 24 hours, and at least 50 hours every 7 days. • Safety Officer and team members will watch and intervene when individuals appear to be fatigued; contact the project manager if a team member appears fatigued. • Night work will not occur on this project. • A journey management plan will be established for team members traveling >250 miles.	
	Parking hazards	10	Park in a clear location, and back in to parking location to avoid backing out upon departure.	3
	Severe weather	10	Assess severe weather hazards and implement appropriate severe weather procedures.	5
ACTIVITY 2 – Load personnel and equipment onto vessel.	Lack of knowledge of tasks being performed	10	• Discuss tasks to be performed by personnel, potential hazards, and control measures.	1
	Water hazards	10	• Follow all appropriate water safety rules and regulations. • Wear Type III or V Personal Flotation Device (PFD) or life jacket.	4
	Severe weather	9	Assess severe weather hazards using National Oceanic and Atmospheric Administration (NOAA) resources before on-water work: • Stop work if lightning is <6 miles away (<30 seconds between lightning flash and hearing thunder). If storm is approaching, do not wait for it to arrive before implementing stop work action. • Stop Work during wind gusts sustained at 25 mph, and at all times where debris is visible flying in air. • Stop work during hail storms; seek shelter inside building or wheelhouse/vessel cabin.	1

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Lifting hazards/muscle strain/ergonomic hazard	10	• Practice proper lifting and manual handing of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 50 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully.	3
	Vessel boarding hazards	10	• Receive vessel operator's training prior to boarding vessel. • Follow vessel operator's instructions for boarding vessel. • Wear a Type III or V PFD or life jacket. Maintain three points of contact when boarding vessel. • Follow vessel operator's instructions for loading equipment onto vessel. • Do not step on any lines on the dock or on the vessel	4
	Pinch points/hand injuries	8	Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. Never position a hand where it can be pinched. Examples of pinch point hazards include: • Between lines under tension and hard surfaces • Between vessel and dock • Between equipment and hard surfaces on vessel	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
ACTIVITY 3 – Work aboard a research vessel on water.	Slips, trips, and falls	8 # 4	• Wear appropriate safety-toed boots with non-slip soles. • Ensure pathways are clear and free of obstruction prior to initiating work, ensure all lines are secure prior to initiating work, and adhere to proper housekeeping practices. • Maintain three points of contact at all times. • Remain seated when vessel is underway • Do not step onto any lines or equipment when boarding vessel.	4
	Fatigue	12	• Extended workdays can be granted; however, workdays shall not exceed 14 hours and extended work weeks, 60 hours/week. • For emergency work, a single shift should be limited to 16 hours, and an employee should be off work for at least 12 hours before the next shift starts. If shift work is required, employees should be given sufficient time to get a continuous 7- to 8-hour period of sleep in each 24 hours, and at least 50 hours every 7 days. • Safety Officer and team members will watch and intervene when individuals appear to be fatigued; contact the project manager if a team member appears fatigued. • Night work will not occur on this project.	2
	Lines and equipment under tension creating line of fire or pinch point	9	• Keep body away from lines under tension. • Keep as much distance as poss ble between you and any source of potential energy release.	2
	Moving parts/pinch points/hand injuries	9	• Be aware of hands, feet, arms, and position of all personnel during tool use and equipment handling. • Never position a hand where it can be pinched if hatch closes, a load releases, or a tool slips.	2
	Water hazards	10	• Vessel operator will provide a SH&E Orientation on	2

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. • Vessel operator will perform a vessel inspection prior to departure. • Vessel operator will submit a float plan to the Project Manager (Jenny Pretare) and follow the float plan and communication plan identified in the float plan. • Passengers will obey Vessel Operator's orders at all times. • Adhere to all federal, state, and local boating and licensing laws. • Work must be performed in accordance with the "Buddy System." • PPE: US Coast Guard (USCG)-approved Type III or V PFD or life jacket, sized and adjusted to the wearer, shall be worn by all workers when aboard the research vessel. • Confirm vessel has secondary means of propulsion such as oars or paddles, backup motor. • Workers are to remain seated when vessel is in motion. Avoid standing in vessel whenever possible.	
	Man overboard (MOB)/incapacitated person	10	• Vessel operator will provide a SH&E Orientation on boating operations prior to departing dock, which will cover the following: man overboard, power loss/disabled boat, fire onboard, medical emergency. Vessel operator will review USCG MOB procedures: • No low visibility/night operations will occur. • When deploying equipment, do not lean over the boat. • When boat is underway, all people must remain in the cabin seated or standing maintaining four points of contact; no work on deck may occur. • All staff aboard vessel will be trained in MOB recovery training. • Perform safety briefing prior to departure and discuss MOB recovery procedure. • Wear Type III or V PFD AT ALL TIMES on board a boat or on dock. • Person who observes person fall overboard must keep their eyes on him/her. • Immediately cease work operations and commence a rescue procedure.	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			• Bring the vessel to the position of the person in the water (as opposed to having the person swim to the boat). • Immediately mark MOB location on GPS by "one-button *MOB* press." • Throw a MOB pole marker/raise a MOB flag into the water to denote the location of the person overboard and to alert other boat traffic. • Throw PFDs or other floatable items into the water to assist the person overboard. Send a distress call on VHF Channel 16 if person is un-responsive or severely injured.	
	Vessel in danger of sinking	10	Vessel operator will be responsible for emergency actions and notifications; however, if the vessel crew is incapacitated the following procedure shall be followed: • Send a distress call: PAN call over VHF Channel 16 if boat is not in imminent danger. • Send a MAYDAY distress call and repeat until message is received over VHF Channel 16 if boat is in imminent danger. o Provide name of vessel o Provide description of boat o Provide location of vessel (latitude/longitude, river mile, landmark, etc.) o Provide number of people onboard o Provide nature of distress o Descr be the kind of assistance needed • Turn on the bilge pump to begin pumping water to outside of boat. • Assemble the emergency pump and begin pumping water.	4
	Vessel fire	10	• Remove all flammable material from ignition sources. • Communicate with Safety Officer and vessel operator if there will be any new flammable material brought onboard; store only in approved containers. Review Safety Data Sheets for firefighting procedures. • Review fire extinguisher location and quantity and confirm fire extinguishers are charged prior to leaving dock • Remember P.A.S.S: o Pull the Pin o Aim the fire extinguisher at the base of the fire	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			○ Squeeze the handle ○ Sweep the base of fire side to side • Send a MAYDAY distress call and repeat until message is received over VHF Channel 16 if boat is in imminent danger. ○ Provide name of vessel ○ Provide description of vessel ○ Provide location of vessel (e.g., latitude/longitude, river mile, landmark, etc. ○ Provide count of onboard passengers. ○ Provide nature of distress. ○ Descr be kind of assistance needed. Inflate life raft/abandon vessel if necessary (e.g., risk of explosion).	
	Medical emergency	8	Vessel operator will review location of First Aid Kit, and AED prior to departing the dock. The Vessel operator or his/her designee will review how the AED operates with the crew prior to departing dock. • Review first aid kit location and contents prior to departure. • If a severe injury occurs, initiate a MAYDAY call. • Travel to Swan Island or location identified by responding EMS. After emergency has been addressed, contact project manager and AECOM reporting line (1-800-348-5046).	2
	Heat stress/cold stress	9	• Begin heat stress/cold stress monitoring as applicable and continue throughout duration of task. • Implement heat stress/cold stress prevention procedures, as applicable. • Heat stress: drink plenty of fluids and use appropriate work/rest schedule. • Cold Weather PPE (<50 degrees F): ○ Dress in layers of non-cotton clothing; examples include down, wool or other synthetic materials to provide insulation when wet. ○ Outer layer to break the wind ○ Hat or hardhat liner ○ Insulated footwear/extra socks if boots allow ○ Gloves which allow for insulation and dexterity ○ Hand warmers ○ Store an emergency set of dry clothing stored in	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			waterproof bag.	
ACTIVITY 4 – Perform fish collection using rod and reel/hook and line.	Severe weather	9	Assess severe weather hazards using NOAA resources before on-water work: • Stop work if lightning is <6 miles away (<30 seconds between lightning flash and hearing thunder). If storm is approaching, do not wait for it to arrive before implementing stop work action. • Stop Work during wind gusts sustained at 25 mph, and at all times where debris is visible flying in air. • Stop work during hail storms; seek shelter inside building or wheelhouse/vessel cabin.	1
	Other commercial/recreational vessel traffic hazards	10	• Adhere to all federal, state, and local boating and licensing laws.	5
	Injuries to self or others while casting	9	• Perform risk assessment before casting. • Note the location of people and equipment onboard. • Never take eyes off of hook/bait while casting • Begin with only a few people casting/fishing then increase as appropriate and as space permits • All people on-deck will wear safety glasses at all times.	3
	Hand injuries (baiting hooks)	6	• Employees should work only with tools with which they are appropriately trained and familiar with and should receive specific instruction on use and operation of unfamiliar tools.	2
ACTIVITY 5 – Surgical Implantation of Acoustic Tags	Exposure to electrical shock	6	• Important procedures are included in the Electronarcosis Safety Inspection Form; this important inspection must be completed each day prior to using equipment. • The electronarcosis unit shall be visually inspected for safety. The inspection form is included as part of this attachment and must be filled out each day prior to using. • A relatively low DC voltage gradient is used to avoid exposure to electrical shock(less than 40 V). Relatively low is explained here: The electronarcosis effect is generally evident at voltage gradients between 0.25 and 0.56 V/cm. Differences in water conductivity and fish size/physiology account for these differences. The electronarcosis operator has fine control of the voltage gradient by way of the power supply adjustment knob,	2

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			and only increases the voltage level (between 0 and 60 Volts DC) to minimally achieve electronarcosis for each individual fish. • Employees operating equipment shall be experienced or trained in electroanesthesia and specific use of the electronarcosis unit. • Follow other Standard Operating Procedures (SOP-7) for Surgical Implantation of Acoustic Tags as specified in the Fish Tracking Field Sampling Plan. • PPE: o Class 00 rated gloves that conform to ASTM D 120 IEC EN600903, when exposure to electrical shock is present o Footwear with ASTM 2413 with an electrical hazard "EH" hazard protection rating	
	Hand injuries (use of scalpel, sutures)	6	• Employees conducting the surgical procedure shall be experienced or trained in the protocol as described in Hudson, J. M., J. R. Johnson, and B. Kynard. 2011. A Portable Electronarcosis System for Anesthetizing Salmonids and Other Fish. North American Journal of Fisheries Management 31:335-339. [Provided as an Attachment] • Follow SOP-7 for Surgical Implantation of Acoustic Tags as specified in the Fish Tracking Field Sampling Plan o ANSI/ISEA 2016 A3 gloves when handling scalpel for surgical implantation. o A disposable sharps container will be on-site for safe collection/disposal of any sharps waste.	2
ACTIVITY 6 – Deploy monitoring equipment using a davit to slowly lower the equipment to the bottom of the river.	Man overboard (MOB)/incapacitated person	10	• The flow or current of the waterway must be investigated prior to work being initiated. Equipment will not be deployed overboard when a ship wake or heavy vessel traffic is nearby. • The employee must be equipped with a USCG Type III or Type V life vest; the life vest must be rated for the employee's weight. • Practice good housekeeping to keep the ground around the work area clear of obstructions, equipment, and other tripping hazards. • The field crew must be comprised of a minimum of two individuals; one will assist the equipment vendor and the attendee will watch for the safety of the working team members.	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			• If one individual must lean outside of the boat confines to perform a task, a lifeline must be attached to the individual using a harness or approved attachment point on Type III or Type V life vest. • If the individual falls out of the boat, the lifeline will permit the individual from floating away from the immediate work area and permit a less hazardous rescue. • Additional MOB controls are described above in Activity 3.	
	Struck by/crush hazard	10	• All lifting operations will be performed under the direction of a competent person. • All lifting equipment must be inspected daily using the attached inspection forms. Initial & Annual Crane inspection form, or equivalent shall be completed prior to use. • At a minimum, the items to be inspected are: o Davit must be inspected prior to use and rated for the anticipated load. o All metal wire rigging must be inspected using attached form. • A lift classification form must be completed prior to the lift. • Always ascertain that the area over which the load will travel is free and clear of personnel or other potential obstacles. • Appropriate rigging of the load will be evaluated prior to any lift. Competent persons designated for this lifting activity will be restricted to our subcontractor's deckhands/vessel specialists. • The lifting/lowering of any equipment must be done in a controlled manner (using a qualified operator, a "test lift," and a safety "tag line," etc. per AECOM SH&E Procedure S3NA 310-PR-1 Cranes and Lifting Devices. • Hard hats are required during lifting operations. • Personnel are not permitted to stand beneath a suspended load. • Once the load is lifted, it will be swung over the boat's gunwale/stern lowered into place. The tag line will be disconnected and davit hook released/recovered. • The receiver mount system was successfully used in the 2017 pilot study and was effective in terms of safe	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			deployment/retrieval.	
ACTIVITY 7 – Recover monitoring equipment using a davit. Equipment is mounted on fixed moorings placed on the river bottom. The equipment will have an acoustic release on it. At retrieval the release will be activated and the equipment with an attached float will ascend to the river surface. The vessel will approach the mounts and either hand-haul the equipment out of the river or use a davit.	Man overboard	6	See Activity 3 and Activity 6 controls above.	3
	Lifting hazards/muscle strain	6	• Practice proper lifting and manual handing of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 50 pounds without assistance or mechanical aid.	3
	Struck by/crush hazard	10	See Activity 6 above.	5
ACTIVITY 8 – Decontaminate equipment.	Lifting hazards/muscle strain	6	• Practice proper lifting and manual handing of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 50 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully.	3
	Potential contaminant exposure	1	The decontamination procedure described in the field sampling plan and summarized below will be followed: • Rinse equipment with river water. • Any water or sediment will be washed into the surface waters near the vicinity of the collection site before proceeding to the next station. • Liquinox (or alternate phosphate-free detergent-bearing liquid wastes from decontamination) will be used to decontaminate equipment that contacts sediment and will be washed overboard. • Rinse with distilled water. • Remove and dispose of nitrile gloves following decontamination procedure. If non-aqueous phase liquids (NAPLs) are encountered, the following procedure will be followed: • Rinse equipment with river water. Any water or sediment contaminated with significant NAPL (more than sheen) will be collected and containerized. • Liquinox (or alternate phosphate-free detergent-	1

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			bearing liquid wastes from decontamination) will be used to decontaminate equipment and drysuits. • Drysuits, boots, and other PPE that cannot be thoroughly decontaminated with Liquinox (or alternate equivalent solution) may be discarded as investigation-derived waste. • Rinse equipment with 0.1 N nitric acid rinse (for equipment only). • Rinse equipment and PPE with distilled water. • Remove and dispose of nitrile gloves following decontamination procedure. • Investigation-derived waste will be managed in accordance with the SOP outlined in Appendix B of the Surface Water and Sediment Trap Field Sampling Plan. • Remove and dispose of nitrile gloves following decontamination procedure. • PPE: safety glasses, hard hats if overhead hazard exists, nitrile gloves, abrasion-resistant gloves when handling heavy items and rubber safety toed boots. Boot covers can be worn over leather safety-toed boots. If a splash hazard exists, use disposable Tyvek or other impermeable clothing which can be washed and rinsed, Wear Type III or V PFD. Additional information for decontamination is found in the Task-Specific Field Sampling Plan.	
ACTIVITY 9 – Disembark vessel once docked.	Lifting hazards/muscle strain	6	• Practice proper lifting and manual handing of materials and equipment, lift with the knees, avoid twisting, and seek assistance or employ additional handling equipment as needed. • Wear abrasion gloves when moving equipment. • No personnel should lift more than 50 pounds without assistance or mechanical aid. Know what items weigh before lifting or test them carefully.	3
	Vessel offloading hazards	10	• Follow vessel operator's instructions for leaving vessel. • Maintain three points of contact when leaving vessel. • Follow vessel operator's instructions for transferring equipment and samples off vessel.	5
	Ergonomic hazards	9	Follow proper ergonomic practices.	3
Activity 10 – Demobilize from Site	Traffic/driving hazards	10	• All AECOM drivers must have current driver awareness training (available on AECOM university)	5

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			• All drivers must have current, valid driver's license on their person. • Complete pre-use visual inspection. Wa k around the vehicle to inspect for potential hazards or mechanical issues before driving. • Practice defensive driving and drive in a courteous manner. • Seat belts must be worn by the driver and all passengers. • Obey all speed limits. • Drivers must not use cellular telephones or other communication devices such as two-way radios unless safely parked. • Window surfaces must be cleared of any materials such as ice, frost, mud, or water that can impair visibility. • Travel with headlights on at all times. • Travel during daylight hours when possible. • Equip vehicles with: first aid kit, fire extinguisher, flares or triangle, spare tire and jack, cell phone. • The project goal is to limit activities to no more than 10 hours/day; contact project manager if work days extend beyond the 10 hours.	
	Fatigue	15	• Extended workdays can be granted; however, workdays shall not exceed 14 hours and extended work weeks, 60 hours/week. • For emergency work, a single shift should be limited to 16 hours, and an employee should be off work for at least 12 hours before the next shift starts. If shift work is required, employees should be given sufficient time to get a continuous 7- to 8-hour period of sleep in each 24 hours, and at least 50 hours every 7 days. • Safety Officer and team members will watch and intervene when individuals appear to be fatigued; contact the project manager if a team member appears fatigued. • Night work will not occur on this project. • A journey management plan will be established for team members traveling >250 miles.	3

SPECIAL REQUIREMENTS

Step #	Equipment to be Used	Inspection Requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Research vessel	Perform boat inspection prior to use. Complete and submit float plan prior to use.	USCG-licensed vessel operator or equivalent. MOB recovery with limited assistance. First Aid/CPR Training. Approved boating safety course. HAZWOPER 40-hour initial training with current 8 hour refresher.
2.	Davit and rigging	Lift classification form Initial Inspection Daily Inspection of Davit and Rigging	Qualified operator and competent person designation Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort. HAZWOPER 40-hour initial training with current 8 hour refresher.
3.	Electronarcosis unit	Daily inspection before use.	Employees operating equipment shall be experienced or trained in electroanesthesia and specific use of the electronarcosis unit. HAZWOPER 40-hour initial training with current 8 hour refresher.
4.	Surgical tools used to implant an acoustic tag in fish	Inspect sutures, and scalpel are disinfected in Nolvasan prior to surgery	Employees conducting the surgical procedure shall be experienced or trained in the protocol as described in Hudson, J. M., J. R. Johnson, and B. Kynard. 2011. A Portable Electronarcosis System for Anesthetizing Salmonids and Other Fish. North American Journal of Fisheries Management 31:335-339.

5.	Acoustic monitoring equipment	Daily inspection before use.	Employees operating equipment shall be experienced or trained in the specific use of the equipment for the purpose of the sampling effort.
6.	Emergency equipment provided by vessel operator (Ballard Marine): • GPS • Satellite phone (if cell phone service does not cover entire survey area) • VHF radios will remain on Channel 16 (for hailing/distress calls) at all times to listen for boat traffic, alerts, etc. unless actively keying/ communicating on another channel with another party • Rescue rope in throw bag (commercially available) or Life Sling • Horn (portable or fixed) and/or whistles • Waterproof flashlight • If vessel is not twin engine, a *secondary “kicker” motor or alternate means of propulsion (oars or paddles) • *Manual bilge pump • *Duct tape • *Mooring lines for securing boat on shore or alongside larger vessel • *Functional bilge pump/emergency pump • *Anchor with suitable sized anchor, 300 feet of anchor rope and 10 feet of chain • *Type 4 throwable ring or cushion • *Type BC fire extinguisher (10 pound) if extra fuel is carried in portable containers. * Required minimum equipment to be provided by vessel provider (chartered boat); project Field Coordinator to ensure remaining equipment is carried on board.	Inspect all equipment for battery life and integrity during the pre-trip boat inspection.	Personnel should be familiar with all emergency equipment.

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

High ⟵ ⟶ Low

Probability	Severity				
	5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
5 - Frequent	25	20	15	10	5
4 - Probable	20	16	12	8	4
3 - Occasional	15	12	9	6	3
2 - Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

High ↕ Low

10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unl kely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Attachment 2.

HEALTH AND SAFETY AND ENVIRONMENTAL PLAN
Portland Harbor RI/FS 2018 studies

Gravity Consulting LLC

Updated February 2018

Prepared for:

Prepared by:

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Gravity Consulting, L.L.C. Project Manager

Shawn Hinz

Jeff Wilson, Gravity Consulting, L.L.C. Health and Safety Manager

The information in this Health and Safety Plan has been designed for the methods presently contemplated by Gravity Consulting L.L.C. (Gravity) for execution of the proposed work. Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Gravity. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, Gravity only makes representations or warranties as to the adequacy of the Health and Safety Plan for currently anticipated activities and conditions.

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Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
COC	Contaminants of Concern
CRZ	Contamination Reduction Zone
DOT	Department of Transportation
ERCP	Emergency Response and Contingency Plan
EZ	Exclusion Zone
GFCI	Ground Fault Circuit Interrupter
HASP	Health and Safety Plan
HSR	Health and Safety Representative
IDLH	Immediately Dangerous to Life or Health
JSA	Job Safety Analysis
LO/TO	Lockout/Tagout
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PHSM	Project Health and Safety Manager
PM	Project Manager
PPE	Personal Protective Equipment
REL	Recommended Exposure Limits
SHSO	Site Health and Safety Officer
SM	Site Manager
SS	Site Supervisor
SSO	Site Safety Officer
SZ	Support Zone
TLV	Threshold Limit Values

1.0 Introduction

This Health and Safety Plan's (HASP) objective is to help establish safe working conditions at the site Portland Harbor Study Site. Safety procedures and protective equipment are chosen according to potential hazards. Specific hazard control methods have been evaluated and selected to minimize the potential of accident or injury.

This HASP prescribes the procedures that must be followed during specific site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Project Health and Safety Manager (PHSM).

The provisions of this plan are mandatory for all personnel and subcontractors assigned to the project. All visitors to the work site must abide by the requirements of this plan. All project participants will attend a pre-job briefing where the contents of this HASP will be discussed. Project staff assigned to this project must sign the Agreement and Acknowledgement Sheet (see Appendix A) to confirm that they understand and agree to abide by the provisions of this plan.

All work will comply with the Occupational Safety and Health Act (OSHA) standard, "Hazardous Waste Operations and Emergency Response" (29 CFR 1910.120) and other federal, state, and local procedures that require the development and implementation of a HASP. Generation of this document certifies that the workplace has been evaluated for hazards. A hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signature(s) and date appearing on the cover page of this document.

1.1 Site Description/Background Information

The PDI study area encompasses the in-river portion of an approximately 27-mile stretch of the Willamette River within Portland Harbor, from approximately RM 1.9 to RM28.4. Project specific information is included in the AECOM Sampling and Analysis plan and HASP.

1.2 Scope of Work

This plan addresses health and safety issues involved with environmental monitoring, sediment, and water characterization.

1.3 Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 1.3.1 for a description of the role and responsibility of each.

Gravity Project Manager: *Shawn Hinz.*	Office: 425-888-8256 Cellular: (b) (6)
Gravity Site Supervisor: *Chad Furulie*	Office: 206-905-9617 Cellular: (b) (6)
Gravity Site Health and Safety Officer: *Jeff Wilson*	Office: 206-905-9617 Cellular: 206-905-9617

1.3.1 Responsibilities of Key Personnel

1.3.1.1 Project Manager

The PM has authority to direct response operations; the PM assumes total control over site activities. In addition, the PM:

- Prepares and organizes background review of the project, the work plan, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Briefs the Site Supervisor (SS), Site Health and Safety Officer (SHSO), and field personnel on specific assignments.
- Together with the SS and SHSO, sees that health and safety requirements are met.
- Consults with the PHSM regarding unsafe conditions, incidents, or changes in site conditions or the scope of work.

1.3.1.2 Site Supervisor

The SS Reports to the PM, has authority to direct response operations, and assumes control over on-site activities. In addition the SS:

- Conducts daily safety meetings.
- Executes the work plan and schedule.
- Manages the construction operations.
- In conjunction with the SHSO, conducts periodic field health and safety inspections to ensure compliance with this HASP.
- Enforces safety procedures.
- Coordinates with the SHSO in enforcing worker protection levels.
- Enforces site control.
- Notifies, when necessary, local public emergency officials.
- In conjunction with the SHSO, responsible for following-up on incident reports to the PM.

1.3.1.3 Site Health and Safety Officer

The SHSO advises the PM and SS on all aspects of health and safety on site. The SHSO stops work if site operations threaten worker or public health and safety and informs the PHSM of any changes in site conditions or project status. In addition, the SHSO:

- Conducts periodic inspections to assess whether the HASP is being followed.
- Periodically inspects protective clothing and equipment.
- Sees that protective clothing and equipment are properly stored and maintained.
- Controls entry and exit at the access control points.
- Performs air monitoring in accordance with this HASP. Maintains and oversees operation of monitoring equipment and interpretation of data from the monitoring equipment.

- Monitors workers for signs of stress, including heat stress, cold exposure, and fatigue.
- Enforces the "buddy" system.
- Is informed of emergency procedures, evacuation routes, and telephone numbers of the local hospital, poison control center, fire department, and police department.
- Notifies, when necessary, local public emergency officials.
- Communicates incidents promptly to SS and PM.
- Maintains communication with PHSM on site activities.
- If applicable, ensures decontamination and disposal procedures are followed.
- Maintains the availability of required equipment.
- Advises appropriate health services and medical personnel of potential exposures.
- Notifies emergency response personnel in the event of an emergency. Coordinates emergency medical care.

1.3.1.4 Project Health and Safety Manager

The specific duties of the HSM include:

- Providing technical input into the design and implementation of the site HASP
- Advising on potential for worker exposure to project hazards along with appropriate methods and/or controls to eliminate site hazards.
- Ensures that a hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signature(s) and date appearing on the cover page of this document

1.3.1.5 Work Team

The Work Team reports to the SS for on-site activities and is responsible for:

- Safely completes on-site tasks required to fulfill the work plan.
- Complies with the HASP.
- Attends and participates in daily safety meetings.
- Notifies the SS and SHSO of suspected unsafe conditions.
- Reports all incidents to the SS and SHSO.

1.4 Health and Safety Training Programs

This Section describes the health and safety training programs that site personnel must comply with.

1.4.1 Medical Surveillance and Respirator Fit Testing

This program tracks the physical condition of the company's employees in compliance with Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.120(e)), and the International Marine Contractors Association (IMCA) requirements for non-marine crew working in the offshore zone . Medical surveillance and Physicals will consist of the following:

- Current medical clearance to conduct hazardous waste field work and to wear a respirator.
- Yearly physicals by offshore trained physician – see Appendix B for medical certifications

1.4.2 Training

Training requirements and programs will comply with the OSHA Hazardous Waste Operations and Emergency Response regulation, 29 CFR 1910.120. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of three days of supervised field instruction.
- Field personnel assigned to the site will also receive 8 hours of refresher training each year.
- Vessel captains require USCG license and/or State training accreditation (Oregon FTL)
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel assigned to site will also receive first aid/CPR and blood borne pathogen training.
- Other training may be required depending on the task to be performed (e.g., confined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

1.4.3 Initial Orientation

Hazardous Waste Operations Initial Health and Safety Orientation will consist of the following:

- All project participants engaged in site operations will attend an initial site orientation where this HASP will be discussed and followed. Personnel will acknowledge having been given the orientation by signing the agreement and acknowledgement form in Appendix A.

2.0 Hazard Analysis

Any change in the scope of work will require an amendment to this HASP. Any task conducted beyond the scope of work identified in this HASP must be evaluated using the Job Safety Analysis (JSA) process prior to conducting the work.

2.1 Job Safety Analysis

Common Gravity work tasks have been evaluated for their hazards and JSA documents developed which detail the chemical, physical and biological hazards associated with these tasks along with the control measures (engineering, administrative and/or personal protective equipment) that will be used to ensure that these tasks are conducted in a safe manner.

The PM and SS will be responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents, and for communicating such information to the PHSM. The PHSM will work with the PM and SS to develop project specific JSAs or provide guidance in the development of JSAs to meet the identified project hazards.

If work tasks are identified during the course of the project which were not previously addressed in the JSA documentation supplied in Appendix C of this HASP then a task-specific JSA document shall be developed at the project site prior to conducting the work. The SS and SHSO shall develop this document(s) with input from the PM and PHSM as needed. Project personnel shall be trained on the contents of the developed task-specific JSA prior to its implementation. A copy of the task-specific JSA form used in this process is supplied in Appendix B of this HASP.

2.2 Hazard Communication Procedures

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are communicated according to 29 CFR 1926.59 to all Gravity personnel and Gravity subcontractors. Personnel must follow the hazard communication procedures listed in Sections 2.3.1 and 2.3.2 when handling corrosive materials.

2.2.1 Corrosive Material Handling Procedures

Corrosive materials include acids and bases. They are extremely corrosive materials with a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide. Observe the following procedures when working with corrosive materials:

- Wear gloves and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face, air-purifying respirator equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Do not add anything into a virgin chemical drum, including unused product.
- Avoid mixing strong acids and bases. Consult the PHSM for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids, add the acid to water in small quantities and mix cautiously.
- When diluting bases, add water to the base in small quantities and mix cautiously.

2.2.2 Hazard Communication Program

2.2.2.1 Container Labeling

Gravity personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

2.2.2.2 Employee Information and Training

An ongoing corporate training program will train employees on chemical hazards. In addition, chemical hazards will be communicated to employees through daily safety meetings and by an initial site orientation program. At a minimum, Gravity and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area.
- How to prevent exposure to these hazardous chemicals.
- What the company has done to prevent workers' exposure to these chemicals.
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDS for hazardous substances found on Gravity sites.
- Emergency spill procedures.
- Proper storage and labeling.

3.0 Project Hazards and Controls

In addition to the Task-Specific JSAs described in the previous section, Section 3 of this HASP lists the health and safety procedures and practices applicable to this project. For additional information, consult with your health and safety professional.

3.1 Daily Safety Meetings

Daily safety meetings make accident prevention a top priority for everyone and makes them aware of important accident prevention techniques. Observe the following daily safety meetings procedures and practices:

- Daily safety meetings will be held each morning prior to site activities
- The tailgate meeting form in Appendix B will be used to document the meeting.

3.2 Physical Hazards and Controls

3.2.1 General Site Activities

- Observe the following general procedures and practices:
- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, water, and clothing.
- No food or beverages shall be present or consumed in a Contamination Reduction Zone (CRZ) or Exclusion Zone (EZ). These are only allowed in designated areas of the support zone.
- No tobacco products shall be present or used, and cosmetics shall not be applied in a CRZ or EZ. These are only allowed in designated areas of the support zone, if areas have been designated.
- Beards, facial hair, or other facial obstructions that interfere with respirator fit will preclude admission to the EZ when respirators are required.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury, splash, etc., must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- All on-site activities will be conducted during daylight hours. If work after dusk becomes necessary due to an emergency, adequate lighting must be provided and notification of such activity made to the location contact.
- Hazardous work, such as handling hazardous materials and heavy loads, and equipment operation, etc., should not be conducted during severe storms.
- All temporary electrical power must have a ground fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

3.2.2 Slip/Trip/Fall

Observe the following procedures and practices to prevent slips/trips/fall:

- Inspect each work area for slip/trip/fall potential prior to each work task.

- Slip/trip/fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

3.2.3 General Falls/Ladders

Observe the following general falls/ladders procedures and practices:

- Assess work areas for fall hazards. A fall protection system is required if work is conducted six feet or over.
- Use Type 1A rated ladders.
- Make sure ladder rungs are sturdy and free of cracks.
- Use ladders with secure safety feet.
- Pitch ladders at a 4:1 ratio.
- Secure ladders at the top or have another person at the bottom to help stabilize it.
- Ladders used to access an upper landing surface shall extend at least three feet above the upper landing surface.
- Do not use ladders for access to air stripper towers above six feet. Instead, use aerial lift.
- Use non-conductive ladders near electrical wires.
- The top step of a stepladder should not be used as a step.
- Do not carry any object or load that could cause a loss of balance or a fall.

3.2.4 Boating Operations

The following precautions shall be followed when conducting boating trailer and launch activities:

- Follow trailer/boat manufacturer's instructions for securing boat to trailer
- Follow trailer/boat manufacturer's instructions for securing boat trailer to towing vehicle
- Prohibit workers from moving into trailer/vehicle pinch points without advising vehicle operator
- Use experienced operators when backing trailers on boat ramps
- Wear proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects
- Maintain all equipment in a safe condition
- Wear reflective warning vests when exposed to vehicular traffic
- Launch boats one at a time to avoid collisions
- Use a spotter for vehicles backing boats to launch area
- Understand and review hand signals
- Wear boots with non-slip soles when launching boats
- Wear USCG approved flotation devices when working on/near water
- Keep ropes and lines coiled and stowed to eliminate trip hazards

- Maintain 3 point contact on dock/pier ladders

The following precautions shall be followed when conducting boating operations:

- Wear USCG Approved personal flotation devices for work activities on or near water
- Provide a floating ring buoy with at least 90 feet of line in the immediate boat launch/land areas
- Step into the center of the boat
- Keep your weight low when moving in the boat
- Move slowly and deliberately
- Steer directly across other boat wakes at 90 degree angle to avoid capsizing
- Steer boat facing forward
- Watch for floating objects in the water
- Right-of-way is yielded to vessels on your boat's right (and vessels with limited ability to maneuver)

The following precautions shall be followed when working on a boat:

- Observe proper lifting techniques
- Obey sensible lifting limits (50 lb. maximum per person manual lifting)
- Use mechanical lifting equipment (pulleys, winches) to move large, awkward loads
- Wear USCG Approved personal flotation devices for work activities on or near water

The following safety related items shall be available when conducting boating operations:

Table 3-2
Safety Equipment Specific to In-Water Work

Additional Safety Equipment for Sampling Vessel per US Coast Guard Requirements:	
• Proper vessel registration, numbering, and documentation (registered with state, certificate of vessel registration number displayed, and carry valid certificate of number • USCG approved Personal Flotation Devices (PFDs/life jackets) for every person on sampling vessel (Type II PFD required, Type 1 PFD preferred as it will turn most unconscious wearers face up in water) • Appropriate, non-expired, visual distress devices for day and night use from the following: – Three hand-held red flares (day and night) or: – One hand-held red flare and two parachute flares (day and night) or; – One hand-held orange smoke signal, two floating orange smoke signals (day) and one electric distress light (night only) • Properly maintained and inspected USCG approved fire extinguishers (no fixed system = (2) B-1 or (1) B-2 type extinguishers, fixed system = (1) B-1 type extinguisher) • Proper ventilation of gasoline powered vessels • Sound producing device (whistle, bell, or horn) • VHF 2-way radio • Not exceed vessel safe loading capacity • Proper navigational light display • Throwable life ring with attached line (any vessel larger than 16 ft is required to carry one Type IV (throwable) PFD	
Additional USCG Recommended Equipment Includes:	
• Extra visual distress signals • Spare Gravity • Heaving line • Fenders • First aid kit • Flashlight • Mirror • Searchlight • Sunburn lotion • Tool kit • Spare fuel • Chart and compass	• Boat hook • Spare propeller • Mooring line • Food and water • Binoculars • Spare batteries • Sunglasses • Marine hardware • Extra clothing • Spare parts • Alternate propulsion (oars/paddles) • Dewatering device (pump or bailer)

3.2.5 Working Over or Near Water

Personal Flotation Devices:

Personal flotation devices are not required where employees are continuously protected from the hazard of drowning by railings, nets, safety belts or other applicable provisions.

Type III, Type V, or better U.S. Coast Guard approved International Orange personal floatation device (PFD) shall be provided and properly worn by all personnel in the following circumstances:

1. On floating pipelines, pontoons, rafts, or stages;
2. On structures extending over or next to water except where guardrails or safety nets are provided for employees;
3. Working alone at night where there are drowning hazards, regardless of other safeguards provided;
4. In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit; or
5. Whenever there is a drowning hazard.

The following precautions shall be followed when using personal floatation devices:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective devices or devices with less than 13 lbs. Buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.
- 30-inch U.S. Coast Guard approved ring buoys with at least 150 feet of 600 pound capacity line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is potential need for life rings to be used after dark. On shore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights, light stanchions) is not provided.

Lifesaving and Safety Boats:

Regulations require that a lifesaving boat is available and ready for use under working conditions where there is a potential for employees to fall into swift running water, such as a river or a strait with strong currents. The following precautions shall be followed concerning the use of lifesaving powerboats:

- At least one lifesaving powerboat shall be immediately available at locations where employees work over or immediately next to water.
- Personnel trained in launching and operating the powerboat shall be readily available during working hours. Lifesaving personnel shall perform a lifesaving drill before the initiation of work at the project site and periodically thereafter (at least monthly or whenever new personnel are involved).
- Powerboats shall be kept afloat or ready for instant launching.
- Lifesaving powerboats shall be equipped, at a minimum, as follows:
  - Two oars (oars not required on boats powered by an inboard motor);
  - Oarlocks attached to the gunwales or the oars;
  - One ball-pointed boat hook;
  - One ring buoy with 50 feet of 600 pound capacity line attached; and
  - PFD's in number equaling the powerboat rating for the maximum number of personnel allowed on board.

- Powerboats shall have flotation tanks or buoyant material capable of floating the boat and its equipment and the crew.
- On vessels without permanently mounted navigational lights, portable battery-operated navigation lights will be available and used for night operations.

3.2.6 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous: e.g., the “teeth” in a pipe wrench can slip if worn smooth; an adjustable wrench will slip if the jaws are sprung; hammerheads can fly off loose handles.
- Tools subject to impact (chisels, star drills, and caulking irons) tend to “mush-room.” Keep them dressed to avoid flying spalls. Use tool holders.
- Don't force tools beyond their capacity. No “homemade” handles or extensions (cheaters) are permitted! Don't use tools for pry bars.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Inspect also for adequate lighting, proper lubrication, and abandoned tools or material that could “vibrate into trouble.”
- Air must be shut off or the electric cord unplugged before making tool adjustments. Air must be “bled down” before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before start-up. Remove cranks, key, or wrenches used in ser-vice work.

3.2.7 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear traffic safety vest when vehicle hazard exists.
- Use cones, flags, barricades, and caution tape to define work area.
- Use vehicle to block work area.
- Engage police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.

3.2.8 Noise

Observe the following procedures and practices regarding noise:

- Wear hearing protection when equipment such as a drill rig, jackhammer, cut saw, air compressor, blower or other heavy equipment is operating on the site.
- Wear hearing protection whenever it is necessary to speak above normal conversational speech due to loud noise—this much noise indicates the need for protection.

- Conduct noise monitoring of suspected high noise operations at the beginning of the workday or start up of new operations to verify noise control/hearing protection requirements.

3.2.9 Lifting and Material Handling

Observe the lifting and material handling procedures and practices:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (wood, piping, drums, etc.).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weights over 60 pounds. Multiple employees or mechanical lifting devices are required for objects over the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; keep the natural curves of the back; do not use back muscles.
- Check route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist body while lifting.
- Know the capacity of any handling device (crane, forklift, chain fall, come-along) that you intend to use.
- Use tag lines to control loads.
- Ensure that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other un-controlled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise

3.2.10 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep site clean; avoid accumulating combustible debris such as paper.
- Follow Hot Work Safety Procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.

- Ensure fire safety integrity of equipment installations according to NEC specifications.

3.2.11 Static Electricity/Transfer of Flammable Liquids

Observe the following procedures and practices regarding static electricity when transferring flammable liquids:

- Do not create static discharge in flammable atmosphere.
- Electrically bond and ground pumps, transfer vessels, tanks, drums, bailers, and probes when moving flammable liquids.
- Electrically bond and ground vacuum trucks and the tanks they are emptying.
- Do not splash fill containers with flammable liquids.
- Pour flammable liquids slowly and carefully.
- Two Fire extinguishers (2A20: BC) must be available, charged, inspected, and readily accessible.

3.2.12 Cleaning Equipment

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

3.3 Environmental Hazards and Controls

3.3.1 Mosquitoes

Mosquitoes in the New Caledonia have been known to carry West Nile Virus, St. Louis encephalitis, and Dengue Fever. To avoid mosquito bites:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors.
- Read and follow the product directions whenever you use insect repellent.
- Wearing long-sleeved clothes and long pants treated with repellent to further reduce your risk, as will staying indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with your local government officials to establish a program.

3.3.2 Poisonous Snakes

Observe the following procedures and practices regarding poisonous snakes:

- Avoid walking in areas where snakes may nest or hide. When walking, always look ahead for signs of snakes.

- Use extreme caution when moving or lifting objects that could be used by snakes as cover.
- Never reach under or behind objects or into other areas where snakes may hide.
- Poisonous snakebites are medical emergencies—seek immediate medical treatment.
- Wear sturdy leather boots.

3.3.3 Bird Droppings

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost – especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 microns, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- Modify the structure or use methods to prevent birds from reestablishing the roost.

3.3.4 Feral Dogs

Feral dogs have shown up on several Gravity jobsites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Don’t run away or run past the dog.
- Remain calm. Don’t scream. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Don’t turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim’s condition. Call 911 if paramedic response is required.
- Call the EHS Department to arrange for medical treatment.

3.3.5 Rodent-Borne Diseases

Rodent infestation in the workplace has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus, which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings or nesting materials are stirred up.

Working conditions that my put workers at risk of hantavirus include:

- Contact with rodent feces or dried urine which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods
- Activities that stir up dust which may mobilize hantavirus

If working in areas of obvious rodent infestation, take the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location
- If an exterminator is not available/possible, employees should clean up the infested area using the following steps
  - When going into outbuildings or rooms that have been closed for an extended period, open them up and air out before cleaning
  - Don an air purifying respirator equipped with HEPA P-100 cartridges and nitrile gloves before cleaning
  - Don't stir up dust by sweeping up or vacuuming up droppings, urine or nesting materials
  - Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of commercial disinfectant.
  - Once everything is wet, take up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
  - Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose in appropriate waste disposal system. Contact the local or state health department for other disposal methods.
  - Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact your supervisor immediately.

3.3.6 Heat Stress

Observe the following general procedures and practices regarding heat stress:

- Increase number of rest breaks and/or rotate workers in shorter work shifts.
- Watch for signs and symptoms of heat exhaustion and fatigue.
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.

3.3.6.1 Signs, Symptoms, and Treatment

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, increased accident probability, etc., to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn since they prevent evaporative body cooling. Wearing personal protective equipment places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing. The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced. To treat, Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, remove employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within one hour. It symptoms include weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue. To treat, remove employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected per-son to become chilled—treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. *This is a medical emergency!* Symptoms include red, hot, dry skin; body temperature of 105◦ Fahrenheit or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse. Since heat stroke is a true medical emergency, transport the victim to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in a cool water bath (however, be careful not to over-chill the victim once body temperature is reduced below 102o F). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.

3.3.6.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to re-place lost body fluids. Replacement fluids can be a 0.1 percent salt-water solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid temperature should be kept cool, 50o F to 60o F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to deter-mine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet including the harmful effects of excessive alcohol and caffeine consumption.

3.3.6.3 Monitoring

Heat stress monitoring will be required when employees are working in environments exceeding 90ºF ambient air temperature. If employees are wearing impermeable clothing, this monitoring will begin at 78ºF. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT) and physiological. The Heat Stress Monitoring Record form (see Appendix B) will be used to record the results of heat stress monitoring.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors which most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25.9oC (78oF), the work regiment in Table 1 and Figure 1 of the section Heat Stress in the latest edition of the "American Conference of Governmental Industrial Hygiene (ACGIH) Threshold Limit Value (TLV) Booklet" should be followed.

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:

- **Heart Rate** – The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse as early as possible during each rest period. If the heart rate of any individual exceeds 75 percent of their calculated maximum heart rate (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is be-low 75 percent of their calculated maximum heart rate.
- **Temperature** – Each individual will measure his/her temperature with a thermometer for one minute as early as possible in the first rest period. If the temperature exceeds 99.6ºF at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4ºF

3.3.6.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

3.3.7 Cold Stress

Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.

- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40^{o} F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is of 32^{o} F or less, hands should be protected.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Implementing a buddy system in which workers are responsible for observing fellow workers for early signs and symptoms of cold stress.
- Adopt by reference any Client specific minimum working temperatures to minimize cold stress

3.3.7.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. Below are listed the signs and symptoms of cold stress. Personnel should follow the appropriate guidelines if any personnel exhibit these symptoms:

Frostbite - Pain in the extremities and loss of manual dexterity. "Frostnip" or reddening of the tissue, accompanied by a tingling or loss of sensation in the extremities. Continuous shivering.

Hypothermia -Pain in the extremities and loss of manual dexterity. Severe, uncontrollable shivering. Inability to maintain level of activity. Excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia: clouded consciousness, low blood pressure, pupil dilation, cease of shivering, unconsciousness, and possible death.

Remove the patient to a warm, dry place. If clothing is wet, remove and replace with dry clothing. Keep patient warm. Re-warming of patient should be gradual to avoid stroke symptoms. Dehydration of the loss of body fluids may result in cold injury due to a significant change in blood flow to the extremities. If patient is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Keep patient warm and calm, remove to a medical facility as soon as possible.

3.3.8 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Stop outdoor work during electrical storms, hailstorms, and other extreme weather conditions such as extreme heat or cold.

- Take cover indoors or in vehicle.
- Listen to local forecasts for warning about specific weather hazards such as tornadoes, hurricanes, and flash floods.

4.0 Personal Protective Equipment

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. EPA levels of protection (D and C). Only PPE that meets the following American National Standards Institute (ANSI) standards are to be worn:

- Eye protection - ANSI Z87.1-1989.
- Head protection - ANSI Z89.1-1986.
- Foot protection - ANSI Z41-1991.
- Traffic vest in high traffic areas and around heavy equipment.

4.1.1 Level D

Level D protection will be used when:

- The atmosphere contains no known hazard
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Threshold Limit Value (TLV)

4.2 Activity Specific Levels of Protection

See Tables 4-2 and 4-3 for general PPE requirements for Levels D and C protection for project work sites.

Level D is the minimum acceptable level for sites where petroleum hydrocarbons are the COC. Upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform. Upgrade to Level C occurs when the results of air monitoring reveals that action levels have been exceeded. Wear hearing protection when there are high noise levels. Workers must maintain proficiency in the use and care of PPE that is to be worn.

Table 4-4
Activity Specific PPE/Air Monitoring Summary

Job Task	PPE Level	Instrument	Monitoring Frequency / Special Requirements
Loading and unloading sample coolers, boat equipment, general non-sampling activities on boat	Level D	N/A	Hard hat for overhead hazards. PFD when working on or near water.
Operation of sampling vessel and equipment from inside boat house	Modified Level D	N/A	Should not leave pilot house if overhead hazards, decontamination chemicals, or sediment exposure is possible. PFD when working on or near water.
Decontamination of sampling equipment	Level D with potential upgrade to Level C	PID	Air monitoring at start up of work at each task location, then every 30 – 60 minutes based upon air monitoring results. Monitor 15 minutes to continuously if

			action levels have been reached. Face shield with hard hat for splash hazard and overhead hazard. PFD when working on or near water.
During sampling out-side and inside cabin	Level D with potential upgrade to Level C	PID	Potential upgrade to Level C when handling samples – presence of product odors. Air monitoring at start up of work at each task location, then every 30 – 60 minutes based upon air monitoring results. Monitor 15 minutes to continuously if action levels have been reached. Face shield with hard hat for splash hazard and overhead hazard. PFD when working on or near water.
General site duties, system O&M, operation of equipment, etc.	Level D	N/A	Hard hat for overhead hazards. PFD when working on or near water.

Note 1: "Start up of work at each new task location" means to monitor the air quality at each new operation on the site. The breathing zone is the area inside a 1-foot radius around the head.

Note 2: A downgrade in the air monitoring program must be approved by the SHSO and HSM.

5.0 Decontamination

5.1 Decontamination Procedures

Operations conducted at this site have the potential to contaminate field equipment and PPE. See the following sections for the decontamination procedures that must be followed to prevent the transfer of contamination to vehicles, administrative offices, and personnel.

5.1.1 Field Equipment

Field equipment can include bailers, interface probes, hand tools, drill augers, and miscellaneous sampling equipment. Observe the following practices and procedures when decontaminating field equipment:

- Decontaminate with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

5.1.2 Disposable PPE

Disposable PPE can include Tyvek suits, inner latex gloves, respirator cartridges. Observe the following practices and procedures when decontaminating disposable PPE:

- Dispose of according to the requirements of the client and state and federal agencies.
- Change out respirator cartridges daily and dispose accordingly.

5.1.3 Non-disposable PPE

Non-disposable PPE can include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out respirator with disinfecting pad prior to donning.
- Decontaminate on site at the close of each day with a solution of an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

5.1.4 Emergency Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

5.1.5 Sanitizing of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to

exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize the respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

6.0 Site Control/Communications

6.1 Site Control

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone (EZ), Contaminant Reduction Zone (CRZ), or Support Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. Each Gravity vessel has its own uniquely defined zones, which are provided the AECOM HASP. In general, cabin areas are defined as Clean Zones, Bow working decks from A-Frame point to front of vessel are Exclusion zones, and a Contaminant Reduction zone will be set-up immediately aft of the cabin area.

The primary purpose for site controls is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by personnel. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry. Site work zones will include:

- **Clean Zone/Support Zone (SZ)**. This uncontaminated zone will be the area outside the exclusion and decontamination (decon) zone and within the geographic perimeters of the site (boat and processing area). This area is used for staging of materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the exclusion zone.
- **Contaminant Reduction Zone (CRZ).** The contaminant reduction zone will provide a location for removal of contaminated PPE and final decontamination of PPE. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the decon area.
- **Exclusion Zone/Hot Zone (EZ)**. The exclusion zone will be the "hot zone" or contaminated area inside the site perimeter (sample collection area of boat). Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the exclusion zone should be posted (i.e., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT BEYOND THIS POINT, etc.). Personnel and equipment decontamination must accompany exit from the exclusion zone.

For sediment investigations, the exclusion zone is defined as the area where individuals may come in direct contact with potentially contaminated sediment (i.e. sampling equipment, decontamination area and chemicals, bow of sampling vessel). For core extrusion activities, the exclusion zone will be defined as the area where extrusion activities occur.

A log of all personnel visiting, entering, or working on the site shall be maintained by the SS or SHSO. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f). Visitors will attend a site orientation given by the SS/SHSO and sign the HASP.

6.1.1 General Site Control Safety Procedures

The following are standard safe work practices that apply to all site personnel; they will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking is prohibited in the EZ/CRZs.

- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel will provide emergency assistance.
- Visual contact will be maintained between buddies on-site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SS/SSO, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the EZ.

6.1.2 Site Security and Work Zone Definition

This Section contains general guidelines for developing site security measures for working in a street or roadway and excavations.

6.1.2.1 Working In Street or Roadway

Observe the following site control practices and procedures when working in streets or road-ways:

- Wear traffic vest and hardhat when vehicle hazard exists.
- Use cones, flag-mounted cones, caution tape, and/or barricades.
- Use vehicle strobe light and block area with truck.
- Develop traffic flow plan for high traffic situations (as appropriate):
  - use flag person
  - use flashing arrow sign
  - use “MEN WORKING” signs liberally
  - obtain lane closing permits
  - engage police details

6.2 Field Communications

Communications between all Shaw employees and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 6-1 for a list of the type of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to ensure proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in Daily Tailgate Safety Meetings.

Table 6-1
Field Communication Methods

Communication Device	Type of Communications	Signal
Telephone On-Site Or Cellular Telephone	Emergency notification	Initiate phone call using applicable emergency numbers
Two-way Radio	Emergency notification among site personnel	Initiate radio communication with Code Red message
Compressed Air Horn	Hailing site personnel for non-emergency	One long blast, one short blast
Compressed Air Horn	Hailing site personnel for emergency evacuation	Three long continuous blasts
Visual	Hailing site personnel for distress, need help	Arms waved in circle overhead
Visual	Hailing site personnel for emergency evacuation	Arms waved in criss-cross over head
Visual	Contaminated air/strong odor	Hands clutching throat
Visual	Break, lunch, end of day	Two hands together, break apart

7.0 Emergency Response and Contingency Plan

In the event of an emergency, immediate action must be taken by the first person to recognize the event.

7.1 Spills and Releases of Hazardous Materials

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number.
- Name and address of facility.
- Time and type of incident.
- Name and quantity of materials involved, if known.
- Extent of injuries.
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802. If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

7.2 Emergency First Aid Procedures

- Maintain a first aid kit and eye wash station on site.
- Survey the situation. Do not endanger your own life. Do not enter a confined space to rescue someone who has been overcome unless properly equipped and trained. Ensure all protocols are followed including that a standby person is pre-sent. If applicable, review MSDS to evaluate response actions for chemical exposures.
- Call 911 (if available) or the fire department immediately. Explain the physical injury, chemical exposure, fire, or release.
- Decontaminate the victim without delaying life-saving procedures.
- If the victim's condition appears to be non-critical, but seems to be more severe than minor cuts, he/she should be transported to the nearest hospital by trained Emergency Medical Services (EMS) personnel: let the doctor assume the responsibility for determining the severity of the injury. If the condition is obviously serious, EMS must transport the victim.
- Notify the PM, SS and the SHSO. Complete the appropriate incident investigation reports.

7.2.1 Stop Bleeding and CPR Guidelines

To Stop Bleeding

Perform the following steps to stop bleeding. Responder must have a current certificate to administer first aid.

1. Give medical statement.
2. Assure airway, breathing, and circulation.
3. Use direct pressure over the wound with clean dressing or your hand (use non-permeable gloves). Direct pressure will control most bleeding.
4. Bleeding from an artery or several injury sites may require direct pressure on a pressure point. Use pressure points for 30 to 60 seconds to help control severe bleeding.
5. Continue primary care and seek medical aid as needed.

CPR

Perform the following steps to administer CPR. Responder must have a current certificate to administer CPR.

1. Make sure the scene is safe before administering aid to the victim.
2. Arousal: Check for consciousness. If not conscious continue with these CPR instructions.
3. Open airway with chin-lift.
4. Look, listen, and feel for breathing.
5. If breathing is absent, give 2 breaths (1 second each) with visible chest rise. NOTE: Use a CPR mask or other approved barrier device if possible.
6. Bare victim's chest and locate CPR finger position.
7. Deliver first cycle of 30 chest compressions at a rate of not less than one per second.
8. Repeat Steps 5, 6 and 7 until an AED has arrived and is ready to deliver a shock, or you have been relieved by another CPR-trained person or professional emergency response personnel.

7.2.2 Injury Management/Incident Notification

Observe the following injury management/incident notification procedures and practices:

Injury Management

Observe the following injury management procedures and practices:

- Once a personal injury incident is discovered the first action will be to ensure the injured party received appropriate medical attention.
- If it is safe to do so, the nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident.
- The work crew supervisor will be summoned. The work crew supervisor will immediately make contact with the PM or other designated individual to alert them of the medical emergency. The work crew supervisor will advise and perform the following "Care of the Employee":
  - Location of the victim at the work site.

- Nature of the emergency.
- Whether the victim is conscious.
- Specific conditions contributing to the injury, if known.
- Escort the injured person to the occupational clinic or hospital or arrange for ambulance.

Notification Requirements

Directly After "Care of the Employee," make the following notifications, in order:

- Contact the PM and H&S Manager immediately
- PM will contact upper line management
- The H&S Manager will facilitate the incident investigation

All client requirements will also be adhered to pertinent to personal injury incident reporting.

Incident Other Than Personal Injury

All incidents including fire, explosion, property damage, environmental release etc. will be responded in accordance with the AECOM site specific Health and Safety Plan. In general, this includes securing the site appropriate to the incident, turning control over the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Gravity will immediately notify the client of any major incident, fire, equipment/ property damage, and environmental incident with a preliminary report. A full report will be provided within 72 hours.

7.3 Site Emergency Information

Table 7-1
Site Emergency Form / Emergency Phone Numbers*

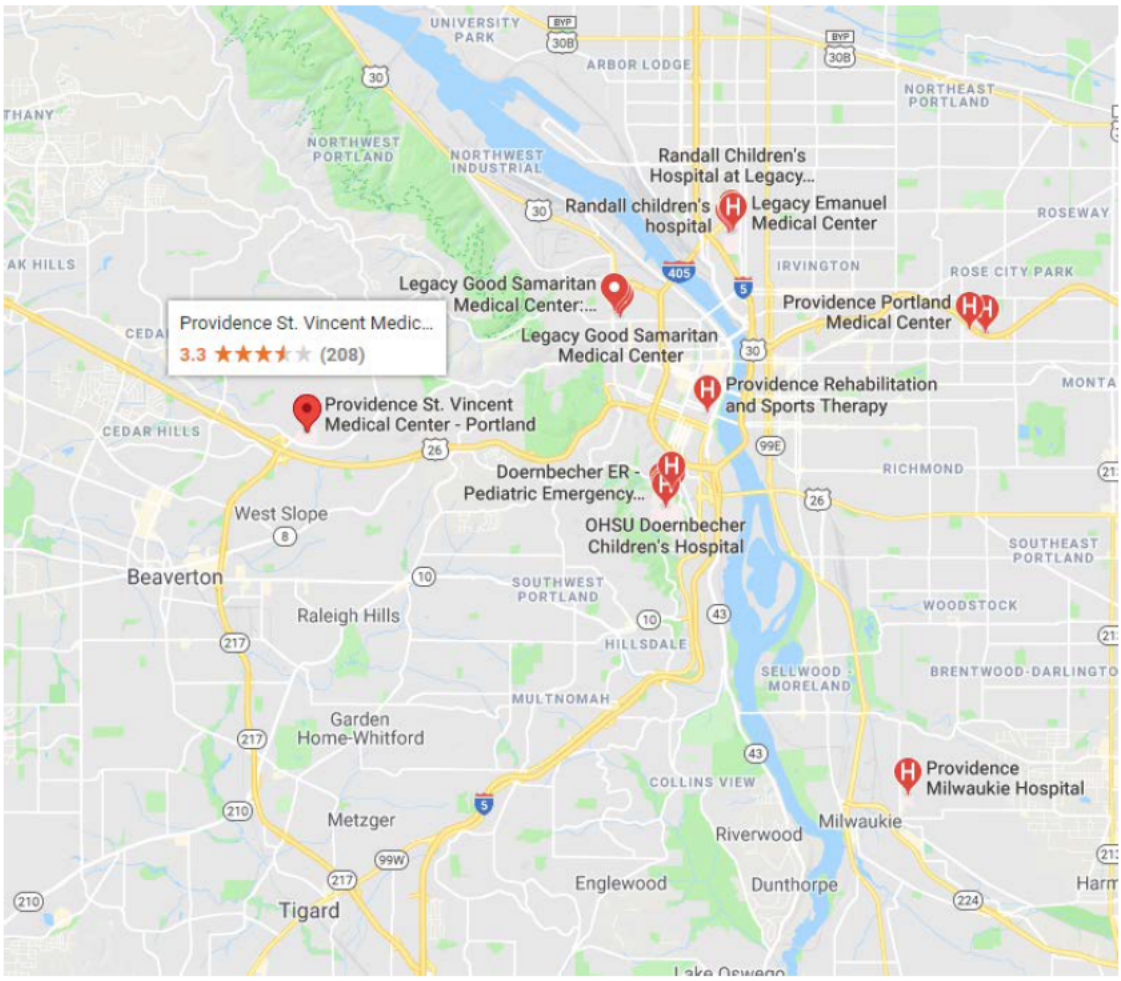
Category	Information
Possible Contaminants of Concern	Heavy Metals, organics
Minimum Level of Protection	Level D
Site(s) Location Address	Fred Devine and Salvage
Emergency Phone Numbers	
Contact	Project Manager (b) (6)
Ambulance	15
Fire	15
Police	16
Poison Control	1-800-222-1212
Project Manager (PM)	Shawn Hinz
Site Supervisor (SS)	Chad Furulie
Site Health and Safety Officer (SHSO)	Jeff Wilson
Project Health and Safety Manager (PHSM)	Jeff Wilson

National Response Center	1-800-424-8802

**In the event of any emergency contact the Project Manager (PM) or the Health and Safety Representatives (SHSO or Project CIH)*

Table 7-2
Hospital Information: Providence St. Vincent

Category	Information
Name:	Providence St. Vincent Medical Center
Address:	9205 SW Barnes Rd,
City, State:	Portland, OR 97225
Phone:	(503) 216-1234
Emergency Phone:	911



APPENDICES

GRAVITY Consulting LLC

Appendix A
Safety Plan Acknowledgement Form

Safety Plan Acknowledgement Form

Project #: 081236 **Project Name:**

I have read the site-safety plan for this site and fully understand its contents.

Date	Name	Company

Attachment 3.

BALLARD MARINE CONSTRUCTION

Project: AECOM/Vessel Services	**Job #:** XXXXXXX	**Date Prepared:** 3/23/2018
Activities: Vessel and davit operating	**Prepared By:** Aimee Sanchez	

ACTIVITY	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
PRIOR TO MOBE		- All gear and equipment will have passed inspection/ testing prior to mobilization to the jobsite. - Equipment that is found to be out of inspection is not permitted to be used and must receive the proper maintenance or inspection and be brought to the attention of the supervisor and equipment manager. - All members have successfully completed training to the appropriate level for their assigned job tasks and duties; in addition, all crew members must be current on the training matrix. - All personnel on the crew have current FA/CPR/AED training. - All members of the crew are qualified to operate all equipment, machinery and tools on the job site. - MSDS sheets will be kept onsite for review by any member of the crew who wishes to do so.
TRUCK & TRAILER MOBE AND DEMOBE	Fire Fuel leaks Minor injuries Break-down Loose HP cylinders (projectile hazard)	- Company vehicles and vessels have operational fire extinguishers. - Company vehicles and vessels have fully stocked spill kits. - Company vehicles and vessels have first aid kits. - Company vehicles have road kits for minor repairs and road safety. - All HP cylinders will be secured with their valve caps on, in the upright position prior to travel.
VESSEL SAFETY	Inability to control vessel	- Vessel will be thoroughly checked prior to transport and operated by qualified pilots. - All vessel operating systems will be verified to be in safe working order prior to getting underway. - Vessels will have emergency equipment onboard that include a buoyant ring with throw line, a fire extinguisher, flares, VHF radio, sorbent material and emergency lighting.
	Visual aids for Restricted Movement	- Vessel will have proper flags and markings clearly shown to notify all marine traffic of restricted movement. - Flares and air horns will be operable for visual and auditory warnings when necessary. - The vessel's marine radio will be on and in working condition at all times. - Contact will be made with the client on site before work begins to verify that means of communication are operational.
	Injury from vessel operation	- All vessel systems that could pose a hazard to personnel will be secured using LOTO prior to operations beginning and will remain secured until all workers are confirmed to be in a safe area clear of the hazard posed by energized vessel systems.
WORKSITE SAFETY	Slips, trips and falls	- Clear work area and walkways of obstructions. - Wear high-traction, safety toe footwear. - Keep walkways dry (if possible) and cover slippery surfaces with slip-resistant materials. - Inspect work areas daily and practice good housekeeping at all times. - Wear appropriate PPE for the task being performed and the location work is occurring at all times (PFD, fall harness, high intensity vest). - PFDs will be worn at all times when there is a risk of drowning unless 100% fall protection is used and able to keep a worker completely out of the water if they were to fall.

Project: AECOM/Vessel Services		**Job #:** XXXXXXX	**Date Prepared: 3/23/2018**
Activities: Vessel and davit operating		**Prepared By:** Aimee Sanchez	
ACTIVITY	**POTENTIAL SAFETY / HEALTH HAZARDS**	**RECOMMENDED CONTROLS**	
	Man overboard Working at heights	- **All personnel working on a vessel or in a location where there is a hazard of drowning must wear a USCG Type III or Type V PFD that has been approved for commercial use.** - **Personnel working over 6 feet (unprotected) will wear fall protection at all times, over 10ft and personnel will use 100% tie-off.** - When fall protection will keep personnel out of the water if a fall is sustained, a PFD is required to be worn on top of fall protection.	
	Struck by dropped or flying objects	- Personnel will wear ANSI approved hard hats, safety glasses, and safety-toe footwear at all times on the job site, sleeved shirts and long pants are required. - Personnel will not stand directly under loads or unstable structures. - Personnel will actively look out for, identify and avoid potential pinch points, particularly when moving and positioning equipment, tools and materials. - Personnel will not conduct work overhead of other workers without first conducting a hazard analysis, ensuring that tools or equipment will not fall on workers below, and without notifying workers that they will be overhead.	
	Inadequate communications	- Utilize portable radios to communicate between workers whenever possible. - At minimum, establish easy-to-understand hand signals and maintain line-of-sight with the personnel you need to be in communication with. - Verify that reception is reliable if cellular phones are the primary communication in the event of an emergency. - Verify that radios are operational and free of cross-talk before beginning operations. - Problems with jobsite communication equipment must be identified and addressed immediately to ensure safe and productive operations.	
	Back strain from heavy lifting	- Use proper lifting techniques at all times. - Utilize the assistance of other crew members when lifting heavy or awkward loads. - Use mechanical lifting equipment whenever feasible. - If lifting injury is sustained, it must be immediately reported to the supervisor and documented on a Supervisor's Report of Injury.	

Project: AECOM/Vessel Services		**Job #:** XXXXXXX	**Date Prepared: 3/23/2018**
Activities: Vessel and davit operating		**Prepared By:** Aimee Sanchez	
ACTIVITY	**POTENTIAL SAFETY / HEALTH HAZARDS**	**RECOMMENDED CONTROLS**	
	Inadequate illumination	- Inspect work areas for inadequate illumination. - Install additional lighting as required to ensure all work areas are illuminated enough to work safely. - Have crew members use portable lighting (headlamps, flashlights) as needed. - Ensure all portable lighting is intrinsically safe in hazardous atmospheres. - **All electrical outlets near water must be connected to ground-fault interrupters (GFI's) at all times.** - All extension cords must have a ground prong and be used along with a GFCI. - Extension cords are to be inspected monthly for damage and wear and tear to the outlet and cord insulation. - Damaged cords must be removed from service and have their outlet cut off to ensure the cord cannot be put back into service. - All damaged cords will either be repaired by a qualified individual or disposed of and replaced with a new cord.	
	Fire and explosion	- Each combustion engine will have its own ABC fire extinguisher that is within inspection and fully charged. - All fire extinguishers will be visually inspected on a monthly basis with the inspection date recorded on the tag. - All employees will be trained in portable fire extinguisher use, P.A.S.S. on an annual basis. - Abandon the area if a fire cannot be contained at incipient stage or if there is an explosion. - Muster upwind of a fire to prevent smoke inhalation injuries. - Supervisors or lead personnel will take roll call at the muster station to verify that all employees are accounted for. - Personnel are not permitted to reenter a hazardous area to look for missing employees. - Keep flammable items at lease 25ft away from ignition sources and oxidizers or behind a fire wall that is at least 5ft high with a fire protection rating of at least 30 minutes. - **Smoking is not allowed on jobsites at any time unless management has approved use of a designated smoking area.** - Designated smoking areas must be kept clean and clear of flammable debris, butts must be contained in an appropriate butt can and the location must be a safe distance away from flammable and combustible storage areas.	

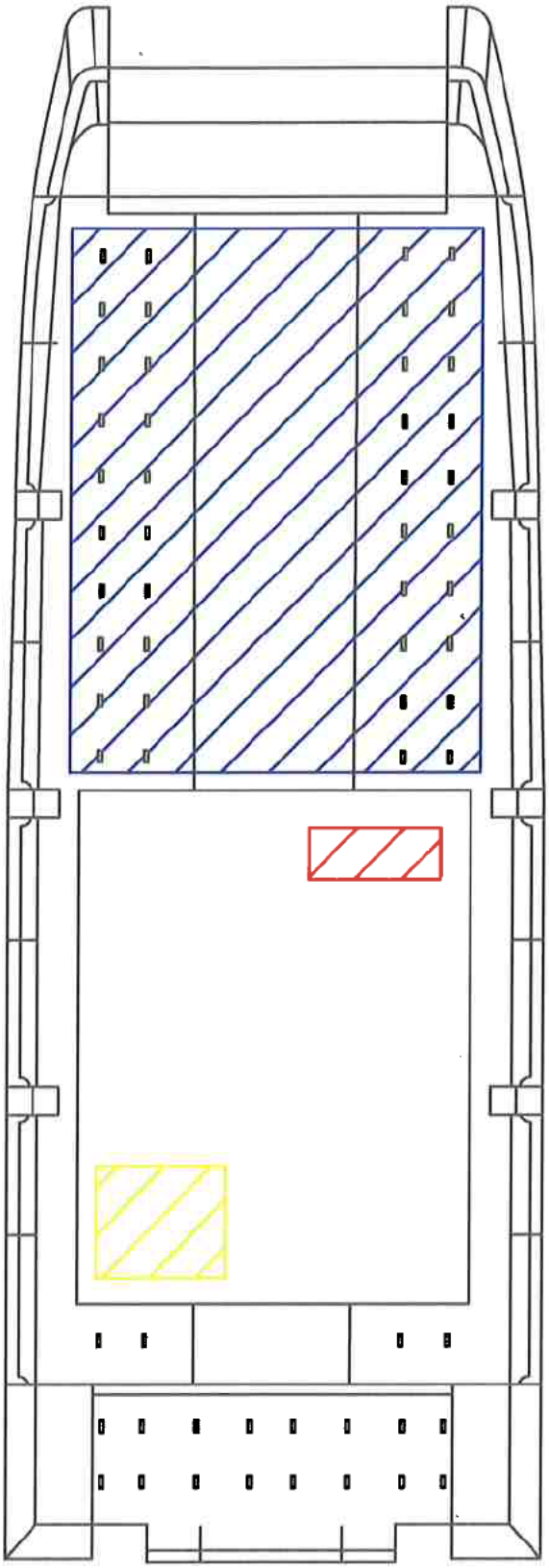
Project: AECOM/Vessel Services		**Job #:** XXXXXXX	**Date Prepared: 3/23/2018**
Activities: Vessel and davit operating		**Prepared By:** Aimee Sanchez	
ACTIVITY	**POTENTIAL SAFETY / HEALTH HAZARDS**	**RECOMMENDED CONTROLS**	
	Spills and releases	- Store fuels, lubricants, and other bulk chemicals in bermed, containment areas capable of containing 110% of the spilled material. - Properly secure all containers after use and ensure that containers are stored properly for the type of material they are holding. - Place spill response kits in strategic locations that are easily accessible by crew members. - Notify the appropriate authorities in accordance with the company Spill Response Plan. - Crews will be familiar with and trained in spill response. - Isolate the spill area, eliminate ignition sources, and evaluate risks before responding to a spill. - Personnel will not respond to a spill without having the appropriate PPE on hand and a briefing on the hazards associated with the contaminant.	
SURGE / SWELLS / WAKES	Surging water Wakes from vessels Tidal change Pulled off bottom Severe weather POIS injury	- All personnel will be aware of surge and wakes from passing vessels to avoid pinch points from vessel or barge movement. - **The supervisor will abort operations if weather conditions become too dangerous for topside personnel (rough seas, strong current, high winds, lighting).**	
TOOLS (ALL)	Equipment malfunction	- All equipment shall be inspected prior to its use. - Safety guards and devices must be in place, tools that are missing safety devices or guards must be removed from service and red-tagged until they can be appropriately repaired of fitted with protective guards. - Should equipment malfunction occur the tool/equipment will be removed from service and red-tagged until it is repaired and can be operated safely.	
	Physical injury	- Personnel will wear ANSI Z87 approved safety glasses at all times on the jobsite. - All personnel must wear appropriate PPE specific to the tool they are operating and its inherent hazards (hearing protection, gloves, hard hat, face shield, safety glasses, leathers, chaps, etc.	
A-FRAMES / DAVITS AND WINCHES	Contact with exposed moving parts	- Inspect winches for exposed moving parts and install guards (if possible/necessary). - Maintain a safe distance from unguarded mechanical equipment until the hazard can be corrected. - **Ensure the area around lifting operations is secured from unauthorized personnel.** - Post hazard warning signs to keep personnel out of the swing radius, landing zone or cable run areas (if needed). - Remove defective equipment from service immediately. - Make sure kill switches for mechanical equipment are located within the operator's reach.	

Project: AECOM/Vessel Services	**Job #:** XXXXXXX	**Date Prepared:** 3/23/2018
Activities: Vessel and davit operating	**Prepared By:** Aimee Sanchez	

ACTIVITY	POTENTIAL SAFETY / HEALTH HAZARDS	RECOMMENDED CONTROLS
	Improper rigging Rigging failure	- All rigging is to be inspected and in good condition prior to use, tags must be present and readable on all rigging equipment. - Ensure rigging is appropriate for the weight, material, type of lift and the way it is to be rigged (i.e. choke, basket, vertical). - Ensure shackles have been inspected, are appropriate for lift and are never side loaded or damaged. - Taglines must be used on every load unless use of taglines will present a greater hazard to personnel.
	Pinch points Personal injury	- Actively look for pinch points and ensure you stay out of them (body and hands) - Avoid standing under the davit arm/A-frame, never walk or stand under a load. - Always wear a hard hat, steel-toed boots, PFD or high intensity road vest, gloves and safety glasses during lifting operations.
	Struck by injury Pinch points	- Contact equipment operator by radio and have him/her stop work or shut down before approaching equipment. - Maintain eye contact with the winch operator before approaching the load. - Do not approach the load from blind spots unless you are in contact with the winch operator or have made eye-contact with the signal man and know that it is safe to approach. - Do not stand near the hydraulic pistons that move the A-frame, never place your hands on these areas when the frame is being positioned. - **When attaching rigging, personnel will keep their feet out from under the load and their hands and bodies clear of potential pinch points when the winch takes a strain on the load.** - Personnel must position themselves in a place that will allow them to have an exit in the event a load becomes uncontrolled or rigging slips or fails.
	Noise hazard	- Hearing protection is required when noise levels reach or exceed 85dB – if you have to shout to be heard by a person 3ft away from you – hearing protection is required). - Regulated areas should be established around high noise areas with signs notifying workers of the noise hazard and hearing protection requirement.
	Deck lines under tension Unsecured equipment.	- Establish safety zones around mooring lines, chains or spud cables under tension. - Personnel should not linger around these safety zones to prevent injuries from snap back from parted lines, chains or cable.

Project: AECOM/Vessel Services		**Job #:** XXXXXXX	**Date Prepared:** 3/23/2018
Activities: Vessel and davit operating		**Prepared By:** Aimee Sanchez	
ACTIVITY	**POTENTIAL SAFETY / HEALTH HAZARDS**	**RECOMMENDED CONTROLS**	
	Electrical shock Electrocution	- **The load line, load and boom must maintain at least 15 ft. clearance from overhead power lines or electrical sources at all times.** - Inspect equipment to make sure there is no defective or exposed wiring. - Ensure electrical equipment is properly grounded. - Keep electrical equipment dry and away from pooled water. - Ensure electrical equipment is connected to ground fault circuit interrupters. - De-energize electrical equipment, secure it, and lock it out before conducting repairs. - **Never approach the area if the davit arm, A-frame, load or load line has made contact with an energy source.** - Shuffle away from the area and do not approach until the power supplying the energy source has been shut off. Call 911 immediately if anyone has been injured.	
CRANE OPERATIONS / MECHANICAL LIFTING EQUIPMENT	Contact with exposed moving parts	- Inspect mechanical equipment for exposed moving parts and install guards (if possible/necessary). - Maintain safe distance from unguarded mechanical equipment until the hazard can be corrected. - **Ensure area around equipment is secured and hazard warning signs are displayed to keep personnel out of the swing radius, landing zone or cable run areas (if needed).** - Remove defective equipment from service immediately. - Make sure kill switches for mechanical equipment are located within the operator's reach.	
	Pinch points Personal injury	- Actively look for pinch points and ensure you stay out of them (body and hands) - Avoid standing under the boom, never walk or stand under a load. - Always wear a hard hat, steel-toed boots, PFD or high intensity road vest, gloves and safety glasses during lifting operations.	
	Improper rigging Rigging failure	- All rigging is to be inspected and in good condition prior to use, tags must be present and readable. - Ensure rigging is appropriate for the weight, material, type of lift and the way it is to be rigged (i.e. choke, basket, vertical). - Ensure shackles have been inspected, are appropriate for lift and are never side loaded - Taglines must be used on every load unless use of taglines will present a greater hazard to personnel.	
	Struck by injury Pinch points	- Contact equipment operator by radio and have him/her stop work or shut down before approaching the crane. - Maintain eye contact with the crane operator or signal man before approaching the load. - Do not approach the load from blind spots unless you are in contact with the crane operator or have made eye-contact with the signal man and know that it is safe to approach. - Do not stand under the boom or load. - **When attaching rigging, personnel will keep their feet out from under the load and their hands and bodies clear of potential pinch points when the crane takes a strain on the load.** - Personnel must position themselves in a place that will allow them to have an exit in the event a load becomes uncontrolled or rigging slips or fails.	

Project: AECOM/Vessel Services		**Job #:** XXXXXXX	**Date Prepared: 3/23/2018**
Activities: Vessel and davit operating		**Prepared By:** Aimee Sanchez	
ACTIVITY	**POTENTIAL SAFETY / HEALTH HAZARDS**	**RECOMMENDED CONTROLS**	
	Noise	- Hearing protection is required when noise levels reach or exceed 85dB – if you have to shout to be heard by a person 3ft away from you – hearing protection is required). - Regulated areas should be established around high noise areas with signs notifying workers of the noise hazard and hearing protection requirement.	
	Struck by deck lines under tension and other unsecured equipment.	- Establish safety zones around mooring lines, chains or spud cables under tension. - Personnel should not linger around these safety zones to prevent injuries from snap back from parted lines, chains or cable.	
	Electrical shock Electrocution	- **The load line, load and davit arm/A-frame must maintain at least a 15 ft. clearance from overhead power lines or electrical sources at all times.** - Inspect equipment to make sure there is no defective or exposed wiring. - Ensure electrical equipment is properly grounded. - Keep electrical equipment dry and away from pooled water. - Ensure electrical equipment is connected to ground fault circuit interrupters. - De-energize electrical equipment, secure it, and lock it out before conducting repairs. - **Never approach the area if the crane boom, outriggers, block, load or load line has made contact with an energy source.** - Shuffle away from the area and do not approach until the power supplying the energy source has been shut off. Call 911 immediately if anyone has been injured.	



Work Area

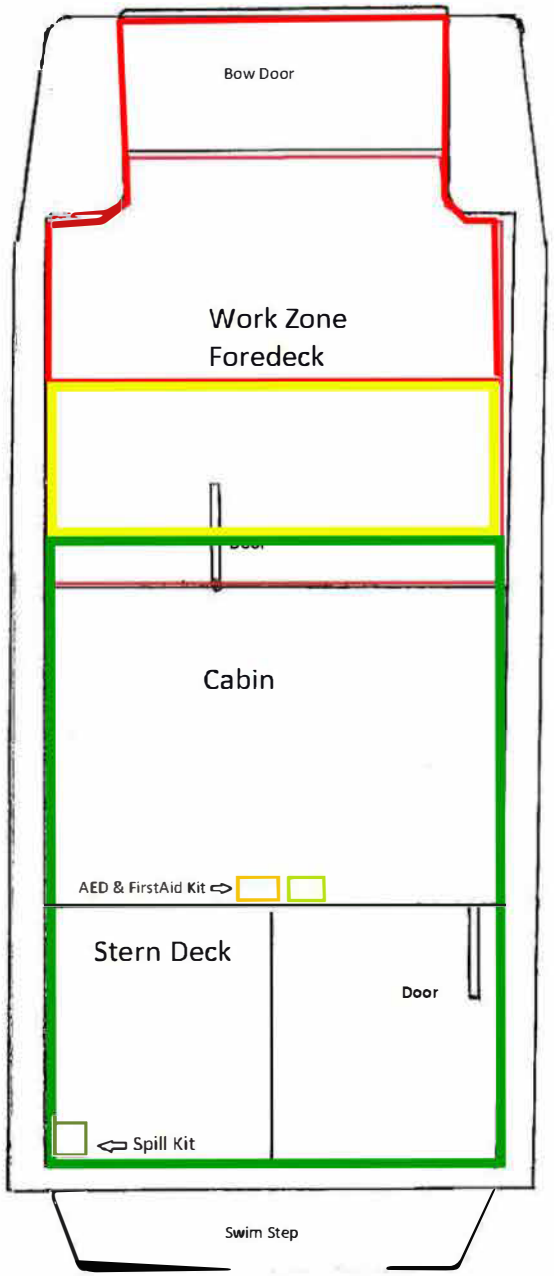
First Aid Kit

Spill Kit

Attachment 4. Gravity Vessel Diagrams

RV Cayuse

Gravity Marine



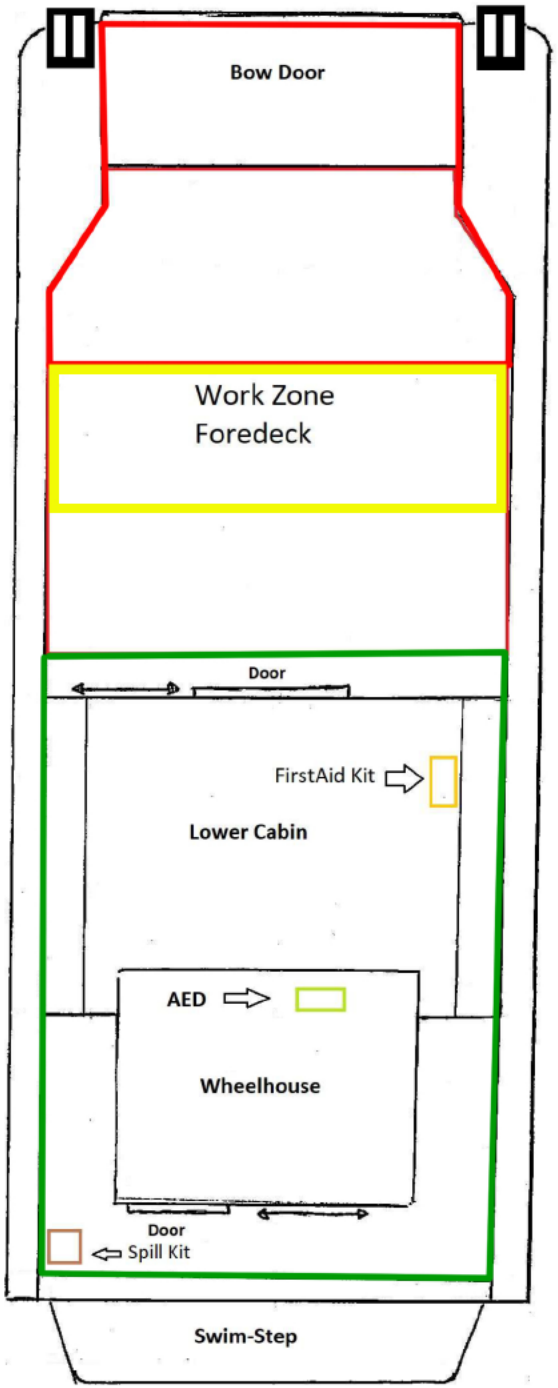
Exclusion Zone

Contaminant Reduction Zone

Support Zone

RV - Tieton

Gravity Marine



Exclusion Zone

Contaminant Reduction Zone

Support Zone

Attachment 5.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision :** 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards Identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

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Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density:**	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities:**	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water):**	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature:**	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature:**	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity:**	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

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Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision :** 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards :**	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other Information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0

SAFETY DATA SHEET

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND THE COMPANY/UNDERTAKING

Product Identifier

Material Name: Nolvasan Solution

Trade Name: NOLVASAN®
Chemical Family: Mixture
Registration Number: EPA Reg. No. 1007-99

Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

Intended Use: Veterinary product used as disinfectant
Restrictions on Use: Not for human use

Details of the Supplier of the Safety Data Sheet

Zoetis Inc.
100 Campus Drive, P.O. Box 651
Florham Park, New Jersey 07932 (USA)
Rocky Mountain Poison and Drug Center Phone: 1-866-531-8896
Product Support/Technical Services Phone: 1-800-366-5288

Zoetis Belgium S.A.
Mercuriusstraat 20
1930 Zaventem
Belgium

Emergency telephone number:
CHEMTREC (24 hours): 1-800-424-9300

Emergency telephone number:
International CHEMTREC (24 hours): +1-703-527-3887

Contact E-Mail: VMIPSrecords@zoetis.com

2. HAZARDS IDENTIFICATION

Appearance: Clear blue liquid

Classification of the Substance or Mixture

GHS - Classification

Acute Toxicity - Dusts and Mists: Category 4
Acute aquatic toxicity: Category 2
Chronic aquatic toxicity: Category 2

Label Elements

Signal Word: Warning

Hazard Statements:
H332 - Harmful if inhaled
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements:
P271 - Use only outdoors or in a well-ventilated area
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P273 - Avoid release to the environment
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTRE/doctor/physician if you feel unwell
P391 - Collect spillage
P501 - Dispose of contents/container in accordance with all local and national regulations

Other Hazards

Short Term: May cause eye irritation . Signs and symptoms might include redness, swelling, blurred vision or pain. May cause slight skin irritation. (based on components) May cause mucous membrane and respiratory tract irritation. Individuals sensitive to this chemical or other materials in its chemical class may develop allergic reactions.

Australian Hazard Classification (NOHSC): Hazardous Substance. Non-Dangerous Goods.

Note: This document has been prepared in accordance with standards for workplace safety, which requires the inclusion of all known hazards of the product or its ingredients regardless of the potential risk. The precautionary statements and warning included may not apply in all cases. Your needs may vary depending upon the potential for exposure in your workplace.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous

Ingredient	CAS Number	EU EINECS/ELINCS List	GHS Classification	%
Chlorhexidine acetate	56-95-1	200-302-4	Acute Tox. 4 (H302) Acute Tox.2(H330) Eye Irrit.2A (H319) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410)	2

Additional Information: Ingredient(s) indicated as hazardous have been assessed under standards for workplace safety. In accordance with 29 CFR 1910.1200, the exact percentage composition of this mixture has been withheld as a trade secret.

For the full text of the CLP/GHS abbreviations mentioned in this Section, see Section 16

4. FIRST AID MEASURES

Description of First Aid Measures

Eye Contact: If irritation occurs or persists, get medical attention. Flush eyes with water for at least 15 minutes.

Skin Contact: Remove contaminated clothing and wash exposed area with soap and water. Obtain medical assistance if irritation occurs.

Ingestion: Never give anything by mouth to an unconscious person. Wash out mouth with water. Do not induce vomiting unless directed by medical personnel. Seek medical attention immediately.

Inhalation: Remove to fresh air and keep patient at rest. Seek medical attention immediately.

Most Important Symptoms and Effects, Both Acute and Delayed

Symptoms and Effects of Exposure: For information on potential signs and symptoms of exposure, See Section 2 - Hazards Identification and/or Section 11 - Toxicological Information.

Medical Conditions Aggravated by Exposure: None known

Indication of the Immediate Medical Attention and Special Treatment Needed

Notes to Physician: None

5. FIRE-FIGHTING MEASURES

Extinguishing Media: Extinguish fires with CO2, extinguishing powder, foam, or water.

Special Hazards Arising from the Substance or Mixture

Hazardous Combustion Products: Formation of toxic gases is possible during heating or fire. May include oxides of carbon nitrogen and products of chlorine .

Fire / Explosion Hazards: Fine particles (such as dust and mists) may fuel fires/explosions.

Advice for Fire-Fighters

During all fire fighting activities, wear appropriate protective equipment, including self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Ensure adequate ventilation. Personnel involved in clean-up should wear appropriate personal protective equipment (see Section 8). Minimize exposure.

Environmental Precautions

Place waste in an appropriately labeled, sealed container for disposal. Care should be taken to avoid environmental release.

Methods and Material for Containment and Cleaning Up

Measures for Cleaning / Collecting: Contain the source of spill if it is safe to do so. Collect spill with absorbent material. Clean spill area thoroughly.

Additional Consideration for Large Spills: Non-essential personnel should be evacuated from affected area. Report emergency situations immediately. Clean up operations should only be undertaken by trained personnel.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Use with adequate ventilation. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. When handling, use appropriate personal protective equipment (see Section 8). Wash thoroughly after handling. Releases to the environment should be avoided. Review and implement appropriate technical and procedural waste water and waste disposal measures to prevent occupational exposure or environmental releases. Potential points of process emissions of this material to the atmosphere should be controlled with dust collectors, HEPA filtration systems or other equivalent controls.

Conditions for Safe Storage, Including any Incompatibilities

Storage Conditions: Store as directed by product packaging.

Incompatible Materials: Acids and bases , As a precautionary measure, keep away from strong oxidizers

Specific end use(s): No data available

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Control Parameters

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

No Occupational Exposure Limit (OEL) or Short Term Exposure Limit (STEL) has been identified.

The purpose of the Occupational Exposure Band (OEB) classification system is to separate substances into different Hazard categories when the available data are sufficient to do so, but inadequate to establish an Occupational Exposure Limit (OEL). The OEB given is based upon an analysis of all currently available data; as such, this value may be subject to revision when new information becomes available.

Chlorhexidine acetate

Zoetis OEB OEB 4 (control exposure to the range of 1ug/m^3 to <10ug/m^3)

Exposure Controls

Engineering Controls: Engineering controls should be used as the primary means to control exposures. Keep airborne contamination levels within the OEB range. General room ventilation is adequate unless the process generates dust, mist or fumes.

Personal Protective Equipment: Refer to applicable national standards and regulations in the selection and use of personal protective equipment (PPE).

Hands: Impervious gloves are recommended if skin contact with drug product is possible and for bulk processing operations.

Eyes: Wear safety glasses or goggles if eye contact is possible.

Skin: Impervious protective clothing is recommended if skin contact with drug product is possible and for bulk processing operations.

Respiratory protection: Whenever air contamination (mist, vapor or odor) is generated, respiratory protection is recommended as a precaution to minimize exposure. If airborne exposures are within or exceed the Occupational Exposure Band (OEB) range, wear an appropriate respirator with a protection factor sufficient to control exposures to the bottom of the OEB range.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid	**Color:**	Blue
Odor:	Pleasant	**Odor Threshold:**	No data available.
Molecular Formula:	Mixture	**Molecular Weight:**	Mixture

Solvent Solubility: No data available
Water Solubility: Soluble
pH: No data available.
Melting/Freezing Point (°C): No data available
Boiling Point (°C): No data available.
Partition Coefficient: (Method, pH, Endpoint, Value)
No data available
Decomposition Temperature (°C): No data available.

Evaporation Rate (Gram/s): No data available
Vapor Pressure (kPa): No data available
Vapor Density (g/ml): 1.01
Relative Density: No data available
Viscosity: No data available

Flammablity:

Autoignition Temperature (Solid) (°C): No data available
Flammability (Solids): No data available
Flash Point (Liquid) (°C): No data available
Upper Explosive Limits (Liquid) (% by Vol.): No data available
Lower Explosive Limits (Liquid) (% by Vol.): No data available

10. STABILITY AND REACTIVITY

Reactivity: No data available
Chemical Stability: Stable under normal conditions of use.
Possibility of Hazardous Reactions
Oxidizing Properties: No data available
Conditions to Avoid: Fine particles (such as dust and mists) may fuel fires/explosions.
Incompatible Materials: Acids and bases , As a precautionary measure, keep away from strong oxidizers
Hazardous Decomposition Products: Toxic fumes of carbon monoxide, carbon dioxide, oxides of nitrogen, hydrogen chloride and other chlorine-containing compounds may be emitted.

11. TOXICOLOGICAL INFORMATION

Information on Toxicological Effects
General Information: Toxicological properties of the formulation have not been investigated. The information in this section describes the potential hazards of the individual ingredients and the formulation.
Routes of exposure: eye contact , skin contact

Acute Toxicity: (Species, Route, End Point, Dose)

Chlorhexidine acetate
Mouse Oral LD 50 2000 mg/kg
Rat Oral LD 50 (F) 1180 / (M) 1710 mg/kg
Rat Inhalation LC 50 0.10 - 0.46 mg/L
Rabbit Dermal LD 50 > 2000 mg/kg

Acute Toxicity Comments: A greater than symbol (>) indicates that the toxicity endpoint being tested was not achievable at the highest dose used in the test.
Inhalation Acute Toxicity May be harmful if inhaled. May cause respiratory tract and mucous membrane irritation.

Irritation / Sensitization: (Study Type, Species, Severity)

Chlorhexidine acetate
Skin Irritation Rabbit Mild
Eye Irritation Rabbit Severe
Skin Sensitization - GPMT Guinea Pig Negative

Irritation / Sensitization Comments: May cause eye irritation based on components.
Skin Irritation / Sensitization May cause mild skin irritation. based on components.

Repeated Dose Toxicity: (Duration, Species, Route, Dose, End Point, Target Organ)

Chlorhexidine acetate
13 Week(s) Rabbit Dermal 500 mg/kg/day LOAEL Liver, Skin

Reproduction & Developmental Toxicity: (Study Type, Species, Route, Dose, End Point, Effect(s))

Chlorhexidine acetate
Embryo / Fetal Development Rat Oral 31.25 mg/kg/day LOEL Maternal toxicity
Embryo / Fetal Development Rat Oral 62.5 mg/kg/day NOEL No effects at maximum dose

Genetic Toxicity: (Study Type, Cell Type/Organism, Result)

11. TOXICOLOGICAL INFORMATION

Chlorhexidine acetate
Mammalian Cell Mutagenicity Mouse Lymphoma Negative
In Vitro Cytogenetics Chinese Hamster Ovary (CHO) cells Negative
In Vivo Micronucleus Rat Hepatocyte Negative

Carcinogen Status: None of the components of this formulation are listed as a carcinogen by IARC, NTP or OSHA.

Product Level Toxicity Data

Inhalation ATE (Acute Toxicity Estimate), calculated	5 mg/l (dusts/mists)
Oral ATE (Acute Toxicity Estimate), calculated	>5000 mg/kg

12. ECOLOGICAL INFORMATION

Environmental Overview: Environmental properties of the formulation have not been investigated. The following information is available for the individual ingredients. Releases to the environment should be avoided.

Toxicity:

Aquatic Toxicity: (Species, Method, End Point, Duration, Result)

Chlorhexidine acetate
Oncorhynchus mykiss (Rainbow Trout) NA LC50 96 Hours 1.9 ppm
Lepomis macrochirus (Bluegill Sunfish) N/A LC50 96 Hours 0.6 ppm
Daphnia Magna (Water Flea) N/A EC50 N/A 0.06 mg/L

Terrestrial Toxicity: (Species, Method, End Point, Duration, Result)

Chlorhexidine acetate
Colinus virginianus (Bobwhite Quail) N/A LD50 N/A 2013 mg/kg

Persistence and Degradability: No data available

Bio-accumulative Potential: No data available

Mobility in Soil: No data available

13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Dispose of waste in accordance with all applicable laws and regulations. Member State specific and Community specific provisions must be considered. Considering the relevant known environmental and human health hazards of the material, review and implement appropriate technical and procedural waste water and waste disposal measures to prevent occupational exposure and environmental release. It is recommended that waste minimization be practiced. The best available technology should be utilized to prevent environmental releases. This may include destructive techniques for waste and wastewater.

14. TRANSPORT INFORMATION

As of January 1, 2015, materials offered for transport that are classified for transportation only as Marine Pollutants and which are packaged in single or combination packagings containing a net quantity per single or inner packaging of 5 Liters or less for liquids or having a net mass per single or inner packaging of 5 kilograms or less for solids are NOT subject to ICAO/IATA, IMDG, or ADR transport regulations provided the general packaging requirements of those regulations are met. Refer to ICAO/IATA A197, IMDG 2.10.2.7, ADR SP 375.

UN number: UN 3082
UN proper shipping name: Environmentally hazardous substances, liquid, n.o.s. (chlorhexidine acetate)
Transport hazard class(es): 9
Packing group: III
Environmental Hazard(s): Marine Pollutant

Please refer to the applicable dangerous goods regulations for additional information. Transport according to the requirements of the appropriate regulatory body.

DOT / ANTT: Not regulated for transportation

15. REGULATORY INFORMATION

Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

Canada - WHMIS: Classifications
WHMIS hazard class:
Non-controlled
This product has been classified in accordance with the hazard criteria of the CPR and the SDS contains all of the information required by the CPR.

Chlorhexidine acetate

15. REGULATORY INFORMATION

CERCLA/SARA 313 Emission reporting	Not Listed
California Proposition 65	Not Listed
Australia (AICS):	Present
EU EINECS/ELINCS List	200-302-4

16. OTHER INFORMATION

Text of CLP/GHS Classification abbreviations mentioned in Section 3

Acute toxicity, oral-Cat.4; H302 - Harmful if swallowed
Acute toxicity, inhalation-Cat.2; H330 - Fatal if inhaled
Serious eye damage/eye irritation-Cat.2A; H319 - Causes serious eye irritation
Hazardous to the aquatic environment, acute toxicity-Cat.1; H400 - Very toxic to aquatic life
Hazardous to the aquatic environment, chronic toxicity-Cat.1; H410 - Very toxic to aquatic life with long lasting effects

Data Sources: The data contained in this SDS may have been gathered from confidential internal sources, raw material suppliers, or from the published literature.

Reasons for Revision: Updated Section 2 - Hazard Identification. Updated Section 3 - Composition / Information on Ingredients. Updated Section 11 - Toxicology Information. Updated Section 14 - Transport Information.

Prepared by: Toxicology and Hazard Communication
Zoetis Global Risk Management

Zoetis Inc. believes that the information contained in this Safety Data Sheet is accurate, and while it is provided in good faith, it is without warranty of any kind, expressed or implied. If data for a hazard are not included in this document there is no known information at this time.

End of Safety Data Sheet

Attachment 6.

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MANAGEMENT BRIEF

A Portable Electronarcosis System for Anesthetizing Salmonids and Other Fish

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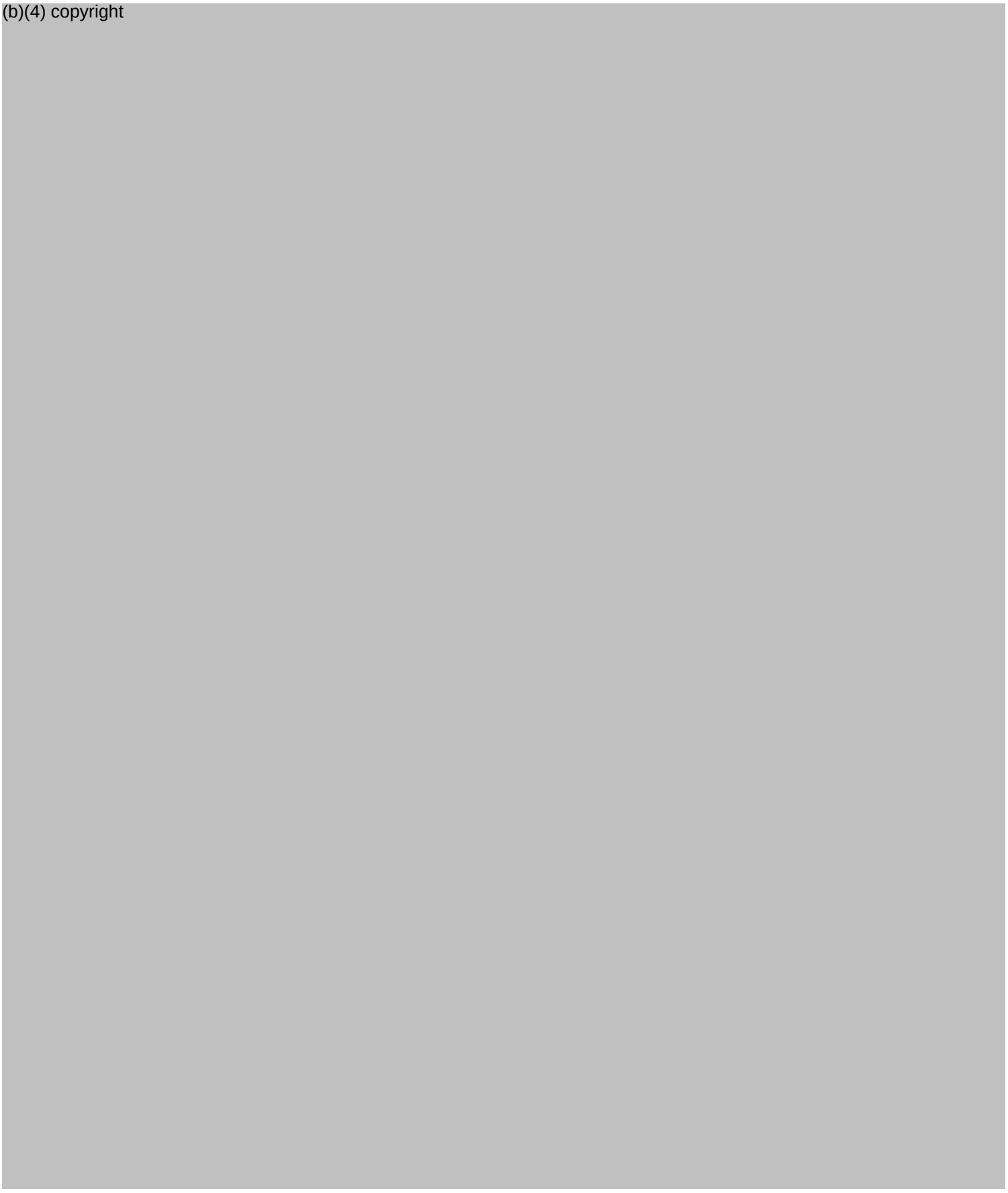
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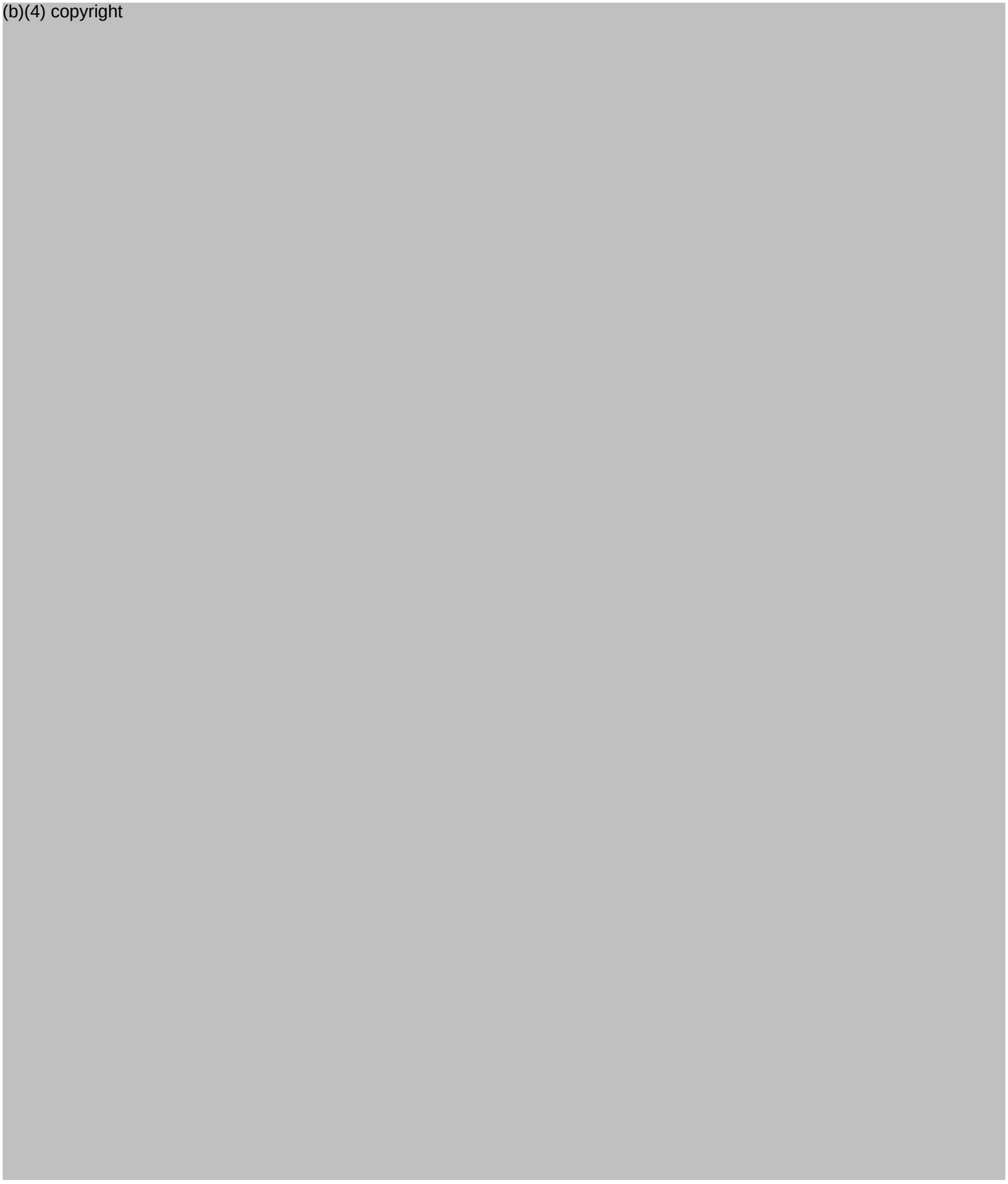
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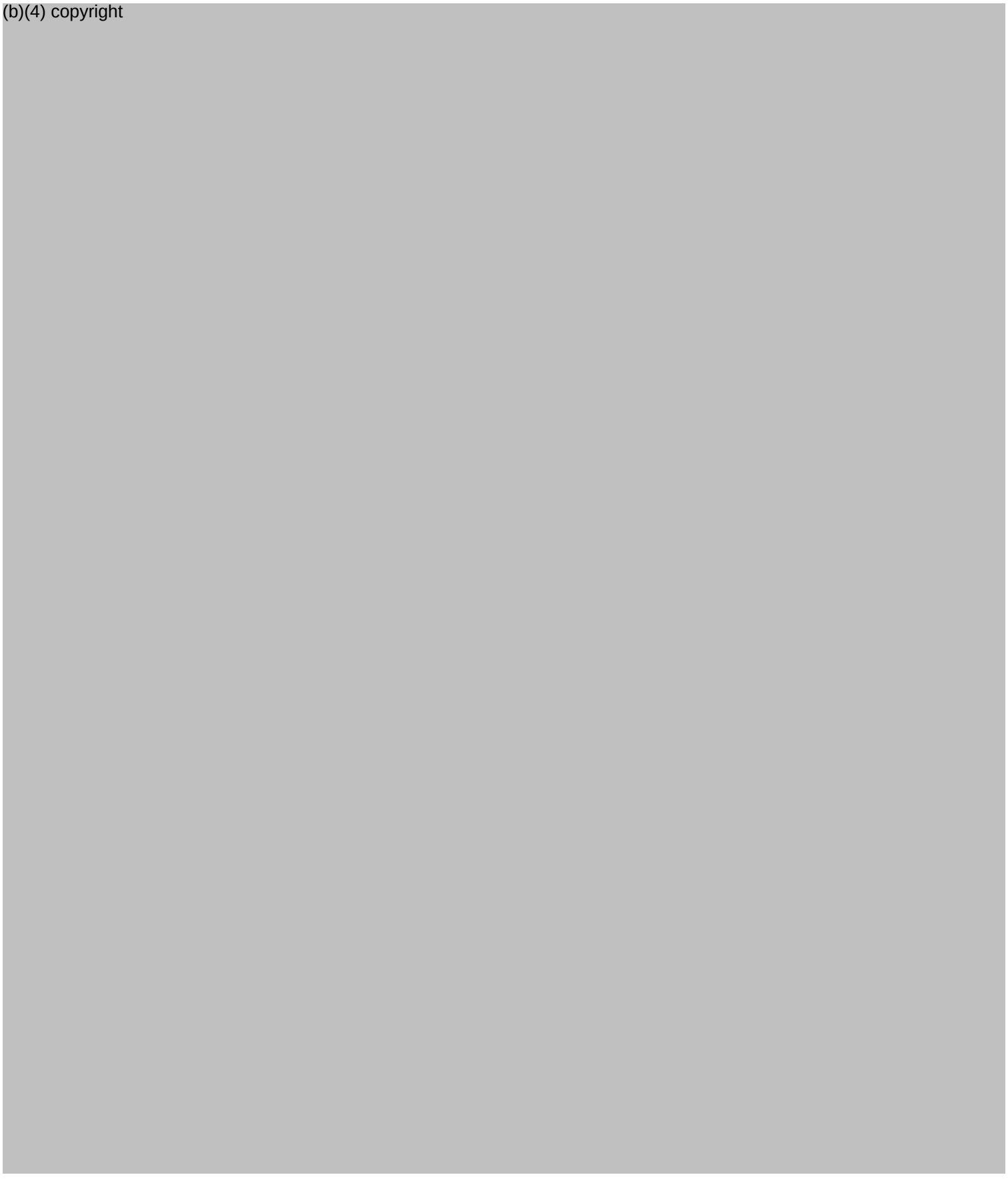
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AECOM

Americas

Lift Classification

S3AM-310-FM2

Date of Lift(s):		Contractor/Subcontractor Name:	
Project Name & Number:		Location of Activity:	
Crane Operator:		Manager / Supervisor:	

The purpose of this checklist is to determine type of lift classification. If any condition and/or situation is not clearly understood or if the lift is identified as Critical, additional documentation and assessment are required.

"ALWAYS LOOK UP AND LIVE." Be aware of overhead hazards, primarily OVERHEAD POWER LINES.

Description of load to be hoisted:

Material/Equipment to be Hoisted		
Will the load be lifted, swung, or placed out of the crane operator's view?	☐ Yes ☐ No	
Will lift require more than one crane or hoisting device?	☐ Yes ☐ No	
Does this lift require any non-routine or technically difficult rigging arrangements?	☐ Yes ☐ No	
Is the load an item of long lead time (to replace if damaged) and could impact project schedule?	☐ Yes ☐ No	
Will the load be lifted over any structures or equipment?	☐ Yes ☐ No	
Will lift take place in a confined or limited access area?	☐ Yes ☐ No	
Does lift involve hoisting personnel?	☐ Yes ☐ No	
Does lift supervisor, operator, or management believe this should be considered a critical lift for any other reason (e.g. wind conditions, proximity to overhead electrical lines, etc.)?	☐ Yes ☐ No	
If the answer to any of the previous questions is **Yes**, **THIS IS NOW CLASSIFIED A CRITICAL LIFT**	☐ Yes ☐ No	
A. Weight of the load to be hoisted:	_____	lbs / kg
B. Weight of the rigging, including the block, jib, and wire rope:	_____	lbs / kg
C. Total weight of the lift (Sum of load weight [Row A] and rigging weight [Row B]):	_____	lbs / kg
D. Radius from the crane's center-pin to the center of the furthest landing or lifting point:	_____	ft / m
E. Boom Angle _____ degrees	Boom length _____ feet / meters	
F. Maximum Load Chart Capacity weight (360-degree capacity) as crane is configured:	_____	lbs / kg
If the weight in Row C is greater the Row F, DO NOT MAKE THE LIFT!		
G. If the weight in Row C is less than the weight in Row F, divide the weight in Row C by the weight in Row F and enter as a percentage:	_____	%
If the percentage in Row G is 75% or greater, DO NOT MAKE THE LIFT YET! THIS IS NOW A CRITICAL LIFT. Contact your SH&E representative or supervisor for a Critical Lift Checklist and procedures.		
If the percentage in Row F is less than 75%, or no unusual conditions have been identified, you may continue with the lift after this form has been signed by the following individuals:		
Comments:		

Crane Operator			
	Print Name	Signature	Date
Manager (Program / Project)			
	Print Name	Signature	Date

AECOM

Americas

Initial & Annual Crane Inspection

S3AM-310-FM1

EQ. Number:	Machine Hours:	Date:	Manufacturer:	Model:	Capacity:	Serial Number:	Location:
Codes: ✕ **Satisfactory** ✓ **Not Satisfactory - Not applicable**			**Crane Type** ☐ **Gantry** ☐ **Crawler** ☐ **Truck** ☐ **RT** ☐ **Tower**				

GENERAL CHECKS

1. ☐ Operator's Manual/Configuration Drawings
2. ☐ Hand Signal Sign
3. ☐ Anti–Two-Block Warning Sign
4. ☐ High–Voltage Warning Sign
5. ☐ Capacity Chart
6. ☐ Warning Horn
7. ☐ Fire Extinguisher
8. ☐ Boom-Angle Indicator
9. ☐ Back-up Alarm
10. ☐ Anti–Two-Block Device (Main)
11. ☐ Anti–Two-Block Device (Auxiliary)
12. ☐ Load-Moment Indicator
13. ☐ Handholds and Steps
14. ☐ Non-Skid Surfaces
15. ☐ Catwalks and Handrails
16. ☐ Tailswing Barrier
17. ☐ Housekeeping, Interior
18. ☐ General Appearance, Exterior
19. ☐ Operator's Seat
20. ☐ Controls Marked
21. ☐ Cab Glass
22. ☐ Drum Turn Indicator
23. ☐ Directional Signals
24. ☐ Head, Tail and Brake Lights
25. ☐ Fluid Levels and Fluid Condition

CRANE CONFIGURATION COMPLIES WITH MANUFACTURER'S DESIGN

1. ☐ Counterweights
2. ☐ Boom Type for Application
3. ☐ Boom Section Location
4. ☐ Pendant Length Relationship
5. ☐ Gantry Position
6. ☐ Mast Position
7. ☐ Boom Hoist Reeving/Bridle
8. ☐ Jib Suspension Reeving
9. ☐ Wire Rope Type/Size
10. ☐ Maximum Boom Not Exceeded
11. ☐ Maximum Jib Not Exceeded

LATTICE BOOM

1. ☐ Boom Stops
2. ☐ Boom Hoist Kickout Operation
3. ☐ Alignment with Revolving Frame
4. ☐ Butt Section Chords, Lacing, Welds
5. ☐ First Intermediate Section, Chords, Lacing, Weld Length _____
6. ☐ Second Intermediate Section, Chords, Lacing, Weld Length _____
7. ☐ Third Intermediate Section, Chords, Lacing, Weld Length _____
8. ☐ Fourth Intermediate Section, Chords, Lacing, Weld Length _____
9. ☐ Fifth Intermediate Section, Chords, Lacing, Weld Length _____
10. ☐ Boom Point Section, Chords, Lacing, Welds, Sheaves, Shaft, Rope Guards, Dead End Device

LATTICE BOOM (Cont.)

11. ☐ Boom in Storage, Chords, Lacing, Welds Length _____
12. ☐ Boom Connecting Pins, Bolts, Keepers
13. ☐ Boom Hinge Pins, Bushings, Keepers
14. ☐ Boom Paint Condition
15. ☐ Boom Top Rollers, Wire Rope Guides
16. ☐ Boom Repairs are According to Manufacturer's Procedures and Documented

JIB

1. ☐ Butt Section, Chords, Lacing, Welds, Pins, Keepers
2. ☐ Intermediate Section, Chords, Lacing, Welds
3. ☐ Point Section, Chords, Lacing, Welds, Sheaves, Shaft, Keepers
4. ☐ Jib Mast or Shear Leg
5. ☐ Jib Stop Installation
6. ☐ Jib Suspension Condition and Proper Anchoring
7. ☐ No Unauthorized Repairs

HYDRAULIC BOOM

1. ☐ Check Operation, Fully Retracting and Extending Boom
2. ☐ Check for Twists, Bends, Viewing Over Top of Boom
3. ☐ Check for Bends, Fully Extended, Viewing from Slide
4. ☐ Check Slide Wear Pads
5. ☐ Check Wear Pad Side Clearance
6. ☐ Attaching Shafts/Keepers
7. ☐ Boom Extension Cylinders
8. ☐ Boom Extension Cables
9. ☐ Boom Hoist Cylinders
10. ☐ Check Vis ble Welds, Attaching Lugs, Pins and Rollers, Check Top, Side and Bottom Boom Plates for Distortion or Cracking
11. ☐ Check Point Sheaves
12. ☐ Check Boom Extension or Jib Chords, Welds, Sheaves, Pins
13. ☐ Boom Repair According to Manufacturer's Procedures and Documented
14. ☐ Paint Condition

GANTRY AND BACK HITCH

1. ☐ Check Welds and Check for Cracks
2. ☐ Sheaves, Shafts, Pins and Keepers
3. ☐ Check for Elongated Pin Holes, Stretched Metal
4. ☐ Lubrication
5. ☐ Crane Roof Condition

WIRE ROPE AND PENDANTS

1. ☐ Pendant Lengths Match
2. ☐ Pendant Pins and Keepers
3. ☐ Pendant Condition at Sockets, and Broken Wire Check
4. ☐ Main Hoist Rope Condition/Reeving
5. ☐ Auxiliary Hoist Rope Condition
6. ☐ Boom Hoist Rope Condition/Reeving
7. ☐ All Hoist Rope Dead Ends
8. ☐ Equalizer Frame, Sheaves, Bearings and Keepers
9. ☐ Wire Rope Guides/Rollers
10. ☐ Lubrication and Preservation
11. ☐ Boom Hoist Rope Certification
12. ☐ Main Hoist Rope Certification
13. ☐ Auxiliary Hoist Rope Certification

REVOLVING FRAME, COUNTERWEIGHT

1. ☐ Check Frame for Cracks and Defects
2. ☐ House Rollers
3. ☐ Hook Rollers and Bolts
4. ☐ Roller Path
5. ☐ Rotec Bearing and Bolts
6. ☐ Counterweight Bolts
7. ☐ "A" Frame and Pins
8. ☐ Cab Condition

LOAD BLOCK, OVERHAUL BALL

1. ☐ Check Main Hook for Cracks
2. ☐ Main Hook Safety Latch
3. ☐ Check Auxiliary Hook for Cracks
4. ☐ Auxiliary Hook Safety Latch
5. ☐ Sheaves, Bearings
6. ☐ Dead End Sockets
7. ☐ Load Block Capacity _____
8. ☐ Overhaul Ball Capacity _____
9. ☐ N.D.T. Main Hook Documentation or Certification by Manufacturer N.D.T. Date _____
10. ☐ N.D.T. Auxiliary Hook Documentation or Certification by Manufacturer N.D.T. Date _____

HOIST AND SWING MACHINERY

1. ☐ Hydraulic Main Hoist
2. ☐ Hydraulic Auxiliary Hoist
3. ☐ Hydraulic Swing and Brake
4. ☐ Hydraulic Supply System
5. ☐ Hydraulic Controls
6. ☐ Swing Pinion
7. ☐ Swing Rock or Gear
8. ☐ Continuous Rotation Test
9. ☐ Swing Clutches
10. ☐ Swing Brake
11. ☐ Swing or House Lock
12. ☐ Swing Reversing Gears
13. ☐ Main Hoist Brake
14. ☐ Main Hoist Clutch
15. ☐ Auxiliary Hoist Brake

HOIST AND SWING MACHINERY (Cont.)

16. ☐ Auxiliary Hoist Clutch
17. ☐ Third Drum Clutch and Brake
18. ☐ Boom Hoist Clutch and Brake
19. ☐ Boom Hoist Dog
20. ☐ Control Rods and Pins
21. ☐ Drive Chains
22. ☐ Drivelines/U-Joints
23. ☐ Power Down Drive and Operation
24. ☐ Hoist Gears
25. ☐ Deck or Travel Gears
26. ☐ Jaw Clutches, Travel, Swing
27. ☐ Gear and Drive Guards
28. ☐ Control Operation, Response
29. ☐ Gauges
30. ☐ Lubrication

UPPER ENGINE, TRANSMISSION, T.C.

1. ☐ Mounting Bolts
2. ☐ Radiator, Fan, Hoses
3. ☐ Belts
4. ☐ Air Cleaner
5. ☐ Air Compressor Pressure: High _____ Low _____
6. ☐ Transmission
7. ☐ Torque Convertor
8. ☐ Electrical System/Batteries
9. ☐ Exhaust System, Rain Cap
10. ☐ Engine Operation
11. ☐ _____
12. ☐ _____
13. ☐ _____
14. ☐ _____
15. ☐ _____

CARBODY AND CRAWLERS

1. ☐ Check for Structural Cracks
2. ☐ Center Pin Bushing
3. ☐ Travel Shaft Gears
4. ☐ Lower Jaw Clutches
5. ☐ Travel Brakes and Dogs
6. ☐ Axles and Fasteners
7. ☐ Travel Chains
8. ☐ Travel Sprockets
9. ☐ Carrier Rollers, Slide Metal
10. ☐ Bottom Rollers
11. ☐ Pad Lugs and Roller Path
12. ☐ Pad Pin Wear and Locks
13. ☐ Travel Motors, Hydraulic, Electric
14. ☐ Travel Reduction Gear Case
15. ☐ Hydraulic Supply System
16. ☐ Crawler Extension Mechanism
17. ☐ Lubrication

CARRIER

1. ☐ Outrigger Operation
2. ☐ Outrigger Structure and Pads
3. ☐ Frame, Cracks and Welds
4. ☐ Drive, Axles, Linkage

CARRIER (Cont.)

5. ☐ Steering Axles, Linkage
6. ☐ Wheel Lug Nuts
7. ☐ Tire Condition, Pressures
8. ☐ Steering Apparatus
9. ☐ Cab, Seat, Gauges, Horn
10. ☐ Radiator, Hoses, Supports
11. ☐ Engine Operation and Mounts
12. ☐ Belts
13. ☐ Air Cleaner
14. ☐ Alternator, Batteries
15. ☐ Main Transmission or Converter
16. ☐ Auxiliary Transmission or Transfer Case
17. ☐ Air Compressor
18. ☐ Record Air Pressures: High _____ Low _____
19. ☐ Service Brakes
20. ☐ Brake Hoses
21. ☐ Parking Brake/Safety Brakes
22. ☐ Exhaust System
23. ☐ Hydraulic Supply
24. ☐ Lubrication

LOAD ENHANCEMENT DEVICE

1. ☐ Ringer Type
2. ☐ Skyhorse
3. ☐ Linkbelt Heavy Life Type
4. ☐ Configuration Complies with Manufacturer's Design
5. ☐ Integrity

MISCELLANEOUS

1. ☐ Log Book, In Machine and Up to Date
2. ☐ All Safety Decals & Warning on Machine
3. ☐ _____
4. ☐ _____
5. ☐ _____

NOTE: Make sure deficient items are noted and corrected. (File in Record Book)

Inspection Date: _____

Inspector: _____

Comments: _____

_____

_____

_____

_____

CRANE LOAD TEST			
MAXIMUM LOAD REQUIRED	**AT RADIUS**	**WITH BOOM LENGTH**	
CRAWLER POSITION ☐ Extended ☐ Retracted		**OUTRIGGER POSITION** ☐ Full ☐ Intermediate ☐ Retracted	
SUPERSTRUCTURE POSITION	**LOAD/POUNDS**	**RADIUS/FT**	**BOOM LENGTH**
1.			
2.			
3.			
RESULTS OF TEST: ☐ Passed ☐ Failed			
REMARKS:			
Inspected By (Please Print):		**Title:**	
Signature:		**Date:**	
Operator (Please Print):		**Date:**	
Signature:		**Date:**	
Repairs Completed By:		**Date:**	

1. Regulations/Standards
   A. Annual inspections are required by various jurisdictional regulations and standards, and as such shall be conducted by a competent person, or by a government or private agency recognized by the applicable jurisdictional regulatory body. AECOM shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.
   B. Monthly inspections are also required by various jurisdictional regulations and standards and shall:
      - Conducted monthly on critical items in use such as brakes, crane hooks, and ropes
      - Written, dated, and signed.
      - Records shall be kept where readily available.
2. The mobile, hydraulic, and crawler crane inspector and operator should be familiar with the requirements of the regulations and standards of the applicable jurisdiction.
3. In addition, regulations sometimes found in nuclear plant construction, marine construction or areas covered by more stringent local laws may require compliance with some or all of the following:
   A. Load Moment Indicators
   B. Manufacturers' or suppliers' certification of breaking strengths of boom hoist, main hoist, and auxiliary hoist ropes. Whenever replacement ropes are purchased, the certification should be requested from the supplier and kept with the equipment records.
   C. Non-destructive testing of load hooks or certification by the hook and block manufacturer.
   D. Load testing, not to exceed 110 percent of rated load at specific radii with the superstructure in various positions or swinging 360°. Limitations based on structural strength should never be exceeded.
   E. Provisions are made for A, B, C, and D in this inspection form if required.
4. No modifications will be made to any of the load-carrying parts or structure of any crane, without written approval of the manufacturer.
5. Welding repairs to booms are to be made according to procedures established by the manufacturer. Booms thus repaired are to be load tested between 100 and 110 percent of rated load prior to being placed back in service.
6. Checks peculiar to a machine may be written under the "Miscellaneous Checks" heading.
7. All inspection reports must be dated and signed.
8. Where discrepancies exist, explain the discrepancies in the "Remarks" section.
9. Wire rope must be taken out of service when any of the following conditions exist:
   A. In running ropes, six randomly distributed wires in one lay, or three broken wires in one strand in one lay.
   B. Wear 1/3 the original diameter of outside individual wires; kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure.
   C. Evidence of heat damage from any cause.
   D. Reductions from nominal diameter of more than 1/64" for diameters up to and including 5/16"; 1/32" for diameters 3/8" to and including 1/2"; 3/64" for diameters 9/16" to and including 3/4"; 1/16" for diameters 7/8".
   E. In standing ropes, more than two broken wires in one lay in section beyond end connections or more than one broken wire at end connection.
   F. Wire rope safety factors must be in accordance with jurisdictional requirements.

AECOM

Americas

Daily Crane Inspection

S3AM-310-FM4

Operations Daily Memo

Equipment Type: _____ **No.** _____

Shift: _____ **Date:** _____

Start Hour Meter: _____ **No. of Loads:** _____

End Hour Meter: _____

Adjustments or Repairs Needed:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Operator: _____

Safety Inspection

	Check One Only		
	OK	N/A	Repair
Service, Parking, and Emergency Brakes	☐	☐	☐
Steering Mechanism	☐	☐	☐
Tires and Wheel Nuts	☐	☐	☐
Lights and Reflectors	☐	☐	☐
Coupling Devices	☐	☐	☐
Operating Controls	☐	☐	☐
Windshield Wiper	☐	☐	☐
Horn	☐	☐	☐
Back-Up Alarm	☐	☐	☐
Seat Belts	☐	☐	☐
Fire Extinguisher	☐	☐	☐
Roadside Reflectors or Flares	☐	☐	☐
Mirrors	☐	☐	☐

Cranes Only

Load Charts/Operator Manual/Log Book	☐	☐	☐
Drum/Winch Brakes	☐	☐	☐
Hoist/Boom Wire Rope and Sheaves	☐	☐	☐
Hooks and Safety Latches	☐	☐	☐
Load and Boom Angle Indicators	☐	☐	☐
Anti-Two Block Device	☐	☐	☐
Drum Rotation Indicators	☐	☐	☐
Boom/Pins and Keepers	☐	☐	☐
Hydraulic Controls/Cylinder Leaks	☐	☐	☐
Outrigger Beams/Pads	☐	☐	☐

AECOM

Americas

Monthly Rigging Inspection

S3AM-310-FM9

Sling Choker Chain- Lifting Beam Number	WIRE ROPE	No. of Damaged Wires	Burn Marks	Corrosion	Fittings Damaged	Bird Caging	SYNTHETIC	No. of "Red" Threads Showing	Burn or Chemical Mark	Label Readable	Fittings Damaged	Heat Damage	CHAIN	Corrosion	Links Worn or Cracked	Label Readable	Heat Damage	LIFTING BEAM	Certified	Modifications w/o Mfg. Approval	Load Capacity Visible	INSPECTION RESULTS	PASS	FAIL– destroy sling/choker
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Block Codes
X=Yes; ✓=No; NA = Not Applicable

Americas

Cranes & Lifting Devices

S3AM-310-PR1

1.0 Purpose and Scope

1.1 This procedure establishes the minimum requirements for rigging, hoisting, and crane operations.

1.2 This procedure is intended to establish general practices for the operation and maintenance of cranes, other lifting devices and rigging equipment in order to minimize the potential for personal injury and property damage. These general practices shall be supplemented by applicable regulatory requirements, and any practices, procedures, and/or operational requirements outlined by the crane, lifting device or rigging equipment manufacturer.

1.3 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

Refer to *S3AM-310-ATT1 Definitions* for a more comprehensive list.

2.1 **ASM –** American Society of Mechanical Engineers

2.2 **Assembly/Disassembly (A/D) Director** – An individual who meets this subpart's requirements for an A/D Director, irrespective of the person's formal job title or whether the person is non-management or management personnel. A/D will be directed by a person who meets the criteria for both a competent person and a qualified person or by a competent person who is assisted by one or more qualified persons. If the assembly/disassembly is being performed by only one person, that person will meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D Director.

2.3 **Controlling Entity –** An employer that is a prime contractor, general contractor, construction manager, constructor or any other legal entity that has the overall responsibility for the construction of the project, including planning, quality, safety and completion.

2.4 **Crane –** Any power-operated equipment that can hoist, lower, and horizontally move a suspended load.

2.5 **Critical lifts –** Loads classified as requiring a formal, written plan. A critical lift plan is defined as a non-routine crane lift requiring detailed planning and additional or unusual safety precautions. Critical lifts include:

- Lifts made when the load is greater than 75 percent of the rated capacity of the crane in the configuration that the lift will be made;
- Lifts that require the load to be lifted, swung, or placed out of the operator's view;
- Lifts made with more than one crane or hoisting device;
- Lifts involving non-routine or technically difficult rigging arrangements;
- Lifts of long lead time permanent materials;
- Lifts that involve lifting loads over structures or equipment;
- Lifts taking place in a confined or limited access areas;
- Hoisting personnel with a crane or derrick; or
- Any lift which the lift supervisor, operator, or other management personnel believes should be considered critical.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM 209 PR1 Risk Assessment & Management

3.5 S3AM-304-PR1 Fall Protection

3.6 S3AM-309-PR1 Heavy Equipment

3.7 S3AM-322-PR1 Overhead Lines

3.8 S3AM-323-PR1 Aerial Work Platforms

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager** (includes **Supervisors**)

- Responsible for confirming that all aspects of this procedure are followed and adhered by all AECOM personnel.
- Confirm appropriate training of personnel to be involved in lifting operations.
- Confirm all necessary information is communicated to all personnel involved or affected.
- Confirm all applicable documentation is completed prior to applicable tasks commencing.
- Participate in the approval of the Critical Lift Plan.

4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Establishing requirements regarding compliance with applicable jurisdictional safety regulations and communicating these requirements to AECOM management.
- Participate in the approval of the Critical Lift Plan.
- Assist as required, in any inspections, audits or investigations.

4.1.3 **Competent Person**

- Confirm appropriate training and experience to be designated a competent person. Refer to *S3AM-202-PR1 Competent Person Designation*.
- Perform inspections of cranes, lifting equipment, and rigging as required.
- Identify and assess risk associated with hazards (e.g. wind, suspended loads, workers entering lift zone, etc.) in order to determine appropriate action.
- Conduct and/or supervise load tests as required.
- Supervise the crane or lifting device operation.
- Determine if it is necessary to reduce rated capacity, and determine appropriate load position, boom location, ground support, travel route, distance from overhead obstructions, and speed of movement necessary to ensure safety.

4.1.4 **Crane Operator**

- Maintain appropriate training / certification / license (as required) by the appropriate regulatory authority. Documentation of certification must be carried by the operator while operating a crane.

- Have practical experience and technical knowledge of pre-operation checks, operator controls, engine start-up, computer set-up and checks, crane operation, inspection, maintenance, characteristics, limitations, and post operation checks on specific cranes
- Be completely familiar with and operate the crane according to the crane's operating manual and load chart. The operator must understand the correct meaning of all notes and be capable of calculating the crane's net capacity under all possible conditions and for every possible configuration of the machine
- Inspect the crane as prescribed by both regulation and the manufacturer.
- Be able to communicate when signals and instructions are given by radio or hand. If any signals are not understood or communication disrupted, the operator shall stop all crane movement.
- Approve the Lift Classification and, as applicable, the Critical Lift Plan and Personnel Platform Lifting form.

4.2 General Requirements

4.2.1 Planning is the key to successful and safe hoisting operations and the prevention of accidents and incidents. Proper planning includes, at a minimum:

- Industrial site or project specific SH&E Plan. Refer to *S3AM-209-PR1 Risk Assessment & Management*.
- Verification of training appropriate to employee's roles in the lift.
    - Managers will confirm that crane operators, signal persons, and riggers are certified/qualified.
    - AECOM personnel will not operate powered cranes without direct approval from the Manager, and SH&E Manager.
- Development of a Task Hazard Assessment (THA) for each of the tasks to be performed during each lift.
- As applicable, assessing ground conditions, weather conditions and power line safety in the lift pre-planning.
- Properly classifying the lift. Complete *S3AM-310-FM2 Lift Classification*, or equivalent, to determine the type of lift to be conducted.
    - This includes correctly identifying when a lift is considered "critical," as defined by this procedure.
    - Preparation for critical lifts shall include completing *S3AM-310-FM3 Critical Lift Plan* or equivalent.
    - If the critical lift involves lifting of personnel, *S3AM-310-FM11 Personnel Platform Lifting* or equivalent shall be completed.
- The results of hazard assessments, required permits, any additional procedures and documentation (e.g. boom truck checklist, engineered lift plan, etc.) associated with the work and the proposed lift shall be communicated to those who will be involved (including client representatives) during the regular tailgate meeting and/or a pre-lift meeting.
- Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the Manager shall coordinate with the Controlling Entity and/or those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
- Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.

4.2.2 Cranes and lifting devices shall be designed, constructed and tested in accordance with the standards applicable to the given jurisdiction (e.g. ASME, CSA).

4.2.3 Cranes and lifting devices shall be inspected and maintained according to manufacturer and regulatory specifications.

- Any deficiencies or unsafe conditions identified in an inspection shall be solved (repaired, altered, replaced) and appropriately verified as safe for operation before the hoisting equipment is placed in service.
- Personnel conducting repairs or alterations shall be qualified to repair or alter the specific equipment.
- The equipment's logbook shall be completed and reflect any inspections, repairs, testing and maintenance completed.
- The equipment owner or the party responsible for the operation of the equipment shall confirm that an up to date logbook is maintained and readily available for review by the operator or any person requiring maintenance information on the equipment.

4.2.4 Work area

- The passing of loads over client facility equipment, trailers, public roads, and sidewalks shall only be done if the necessary precautions have been taken for the safety of all workers and other persons.
- When operating conditions are such that the boom of the crane swings over property lines or operating transportation systems, the owners of adjacent properties or systems shall be consulted. A diagram should be prepared detailing the proposed swing paths for the crane.
- Work area control. Prior to equipment operation, the manager (or his/her designee) shall either:
  - Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas (lift zone, swing radius, path of travel, landing zone, etc.); or
  - The hazard areas shall be clearly marked by a combination of warning signs and high-visibility markings on the equipment that identify the hazard areas. In addition, the manager (or his/her designee) shall train the workers to understand what these markings signify.

4.2.5 The operator shall know total weight of every load being lifted, operating radius for lift as well as the maximum lift height and final position of the load.

4.2.6 Confirm the lifting equipment and rigging capacities are not exceeded.

4.2.7 All hooks on hoisting equipment shall be equipped with safety hooks.

4.2.8 All rigging shall be properly maintained and stored according to manufacturer's specifications.

- Inspect all rigging to be used (i.e. hooks, wire rope, chains, slings, etc.) for deficiencies (i.e. bird-caging, broken wires, abrasion, cuts, nicks, bent links, bent hooks, etc.), before each use and at appropriate intervals.
- Deficient equipment shall be removed from service, tagged out and/or reuse prevented (e.g. slings cut). If in doubt, do not use. Refer to *S3AM-310-ATT3 Rigging*.

4.2.9 Only loads that have been properly rigged or have been placed in containers designed for hoisting may be lifted.

4.2.10 Loads should only be rigged for hoisting by qualified persons.

4.2.11 Determine the center of gravity or point of balance. All loads shall be freely suspended over the load's center of gravity and clear to lift, avoiding any possible shock or impact load, as well as any obstructions or boom clearance concerns.

4.2.12 Utilize taglines to control load movement:

- If tagline usage poses a safety hazard this shall be reflected in the planned procedure and the task hazard assessment, and a short line of suitable length shall be attached to allow the worker to catch the load.
- If electrical hazards are present the tag line shall be non-conductive.

4.2.13 Watch for the roll or swing of the load:

- As immediate correct identification of center of gravity may not be possible, swing or roll of the load due to the load line not positioned directly above center of gravity may occur.
- Anticipate the direction of the swing or roll and work away from it.

4.2.14 Confirm body is never placed between material, equipment or any stationary object and the load swing. Stay away from stacked material that may be knocked over by a swinging load.

4.2.15 Confirm all personnel stand clear from the load being lifted and the path of travel or swing path. Utilize suitable signage and/or barricading.

4.2.16 Loads shall not pass over personnel, occupied buildings or critical operating facilities.

4.2.17 Look over the area where the load is to be positioned. Remove unnecessary blocks or other objects that might fly up if struck by the load.

4.2.18 Never leave a load suspended when the lifting device or crane is unattended.

4.2.19 Never permit anyone to ride the lifting hook or the load.

4.2.20 When lowering or setting the load, be sure feet and all other body parts are out from under the load.

- Set the load down easily and slowly.
- All loads transported by sling shall be grounded and/or cables touch the ground prior to personnel contacting the rigging. This is to prevent a discharge of electrical current that can generate during transport. Under some conditions the current can arc up to 8 inches (20 centimeters).
- Confirm load will not shift before removing rigging.
- Loose loads will be blocked before unhooking.

4.3 Ground Conditions

4.3.1 This section does not apply to side-boom cranes.

4.3.2 Do not assemble or use lifting devices or cranes unless ground conditions are firm, drained (except for marshes/wetlands), and graded to a sufficient extent that, in conjunction with the use of supporting materials (if necessary), the equipment manufacturer's specifications for adequate support and degree of equipment level are met.

4.3.3 Controlling entity means a prime contractor, general contractor, or construction manager, or any other legal entity having the overall planning, quality, and completion responsibility for the construction of the project. The controlling entity shall:

- Confirm that ground preparations necessary to meet the requirements in 4.3.1 of this section are provided.
- Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity.

4.3.4 If the assembly/disassembly (A/D) supervisor determines that ground conditions do not meet the requirements for safe lifting, that applicable manager (or his/her designee) shall notify the controlling entity regarding the ground preparations that are needed.

4.4 Crane Inspection

4.4.1 Initial & Annual (Comprehensive)

- Prior to using any cranes, and at least every 12 months thereafter, an Initial/Annual Inspection and a Crane Load Test shall be conducted on such equipment.
  - *S3AM-310-FM1 Initial & Annual Crane Inspection* or equivalent shall be completed.
  - All initial and annual crane inspections shall be carried out by a Professional Engineer licensed to practice in the jurisdiction, or where applicable by legislation, by a qualified person designated by the Engineer. .
- Identified deficiencies shall be corrected an inspected by the professional engineer or qualified person.
- Cranes involved in misadventure (i.e. shock load, electrical contact, etc.) that results in suspicion of potential or actual damage shall undergo a comprehensive inspection by a professional engineer or, as permitted by the applicable jurisdiction, a qualified person, and be verified as safe for operation prior to use.
- Cranes that have been idle for 3 months or more shall be inspected by a qualified person using *S3AM-310-FM1 Initial & Annual Crane Inspection* or equivalent.
- No crane shall be put into use before an inspection has been completed and absence of defects or hazards has been verified.

4.4.2 Modified Equipment

- Lifting devices and cranes that have modifications or additions that affect the safe operation of the equipment (such as modifications or additions involving a safety device or operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity shall be inspected by a qualified person (e.g. professional engineer) after such modifications/additions have been completed and prior to initial use. The inspection shall meet the following requirements:
  - Confirm that modifications or additions have been done in accordance with the approval obtained.
  - Prior to initial use, and under the direction of a qualified person, load-test all lifting devices and cranes in which load-sustaining parts have been altered, replaced, or repaired. The replacement of wire rope is specifically excluded from this requirement; however, a functional test of the crane under a normal operating load will be made prior to putting a crane back into service.

4.4.3 Repaired or Adjusted Equipment

- Lifting devices and cranes that have had a repair or adjustment relating to safe operation (such as a repair or adjustment to a safety device or operator aid, or to a critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) shall be inspected by a qualified person after such a repair or

adjustment has been completed, prior to initial use. The inspection shall meet the following requirements:

- The qualified person will determine if the repair/adjustment meets manufacturer's equipment criteria.
- Prior to use after repair or adjustment of equipment, all lifting devices and cranes in which load-sustaining parts have been altered, replaced, or repaired shall be load-tested by, or under the direction of, a qualified person. The replacement of wire rope is specifically excluded from this requirement; however, a functional test of the crane under a normal operating load will be made prior to putting a crane back into service.

4.4.4 Post-Assembly

- Upon completion of assembly, the equipment shall be inspected by a qualified person to assure that it is configured in accordance with the manufacturer's equipment criteria.
- Do not use equipment until an inspection under this paragraph demonstrates that the equipment is configured in accordance with the applicable criteria.

4.4.5 Each Shift (Daily)

- A competent person shall begin a visual inspection prior to each shift or operation.
- Document using *S3AM-310-FM4 Daily Crane Inspection*, or equivalent, to provide adequate documentation of the inspection. The inspection will consist of observation for apparent deficiencies.
- Disassembly is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating disassembly is needed.
- Determinations made in conducting the inspection will be reassessed in light of observations made during operation.

4.4.6 Monthly

- Each month the crane is in service, it shall be inspected by a qualified person using *S3AM-310-FM5 Monthly Crane Inspection*, or equivalent.
- Equipment shall not be used until an inspection under this paragraph demonstrates that no deficiencies are found.

4.4.7 Any part of the manufacturer's procedures regarding inspections relating to safe operation (e.g. safety device or operator aid, critical part of a control system, load-sustaining structural components, load hook, or in-use operating mechanism) that is more comprehensive or has a more frequent schedule than the requirements of this section will be followed.

4.4.8 Documentation

- Maintain all inspection forms on file at the job site for review by interested parties for the duration of the project.

4.5 Wire Rope Inspection

4.5.1 Shift Inspection

- A competent person will conduct a visual inspection of wire ropes prior to each shift. They will observe wire ropes (running and standing) that are reasonably likely to be used during the shift for apparent deficiencies, including those listed below. Untwisting (opening) of wire rope or booming down is not required as part of this inspection.
- Apparent Deficiencies
  - Category I

        - Significant distortion of the wire rope structure such as kinking, crushing, unstranding, bird caging, signs of core failure, or steel core protrusion between the outer strands.
        - Significant corrosion.
        - Electric arc (from a source other than power lines) or heat damage.
        - Improperly applied end connections.
        - Significantly corroded, cracked, bent, or worn end connections (such as from severe service).
    - Category II
        - Visible broken wires, as follows:
            a. In running wire ropes: Six randomly distributed broken wires in one rope lay, or three broken wire in one strand in one rope lay, where a rope lay is the length along the rope in which one strand makes a complete revolution around the rope.
            b. In rotation-resistant ropes: Two randomly distributed broken wires in six rope diameters, or four randomly distributed broken wires in 30 rope diameters.
            c. In pendants or standing wire ropes: More than two broken wires in one rope lay located in rope beyond end connections, and/or more than one broken wire in a rope.
        - A diameter reduction of more than 5 percent from nominal diameter.
    - Category III
        - In rotation-resistant wire rope, core protrusion or other distortion indicating core failure.
        - Electrical contact with a power line.
        - A broken strand
- Critical review items. The competent person will pay particular attention to:
    - Rotation-resistant wire rope in use.
    - Wire rope being used for boom hoists and luffing hoists, particularly at reverse bends.
    - Wire rope at flange points, crossover points, and repetitive pickup points on drums.
    - Wire rope adjacent to end connections.
    - Wire rope at, and on, equalizer sheaves.
- Removal from service
    - If a deficiency in Category I is identified, an immediate determination will be made by the competent person as to whether the deficiency constitutes a safety hazard. If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question will be prohibited until:
        - The wire rope is replaced; or
        - If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.
    - If a deficiency in Category II is identified, the manager (or his/her designee) will comply with Option A or Option B, as follows:

- Option A. Consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service, or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard, operations involving use of the wire rope in question will be prohibited until the wire rope is replaced; or
- Option B. If the deficiency is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited.

- If a deficiency in Category III is identified, operations involving use of the wire rope in question will be prohibited until:
  - The wire rope is replaced; or
  - If the deficiency (other than power line contact) is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited. Repair of wire rope that contacted an energized power line is also prohibited.
- Where a wire rope is required to be removed from service under this section, either the equipment (as a whole) or the hoist with that wire rope will be tagged-out, in accordance with this procedure, until the wire rope is repaired or replaced

4.5.2 Monthly Wire Rope Inspection

- Each month a wire rope inspection will be conducted in accordance with the monthly crane inspection. Document the inspection using *S3AM-310-FM6 Wire Rope & Hook Inspection*, or equivalent.
- In addition, at least every 12 months, the wire ropes in use on equipment will be inspected by a qualified person for the types of deficiencies listed below.
  - The inspection will be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to:
    - Categories I, II, and III and critical review items.
    - Those sections that are normally hidden during shift and monthly inspections.
    - Wire rope in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.
    - Wire rope subject to reverse bends.
    - Wire rope passing over sheaves.
    - Wire rope at or near terminal ends.
  - In the event a 12-month inspection is not feasible due to existing set-up and configuration of the equipment (such as where an assist crane is needed) or due to site conditions (such as a dense urban setting), such inspections will be conducted as soon as they becomes feasible, but no longer than an additional 6 months for running ropes; and for standing ropes, at the time of disassembly.
- If a deficiency is identified, an immediate determination will be made by the qualified person as to whether the deficiency constitutes a safety hazard.
  - If the deficiency is determined to constitute a safety hazard, operations involving use of the wire rope in question will be prohibited until:
    - The wire rope is replaced; or

- If the deficiency is localized, the problem is corrected by severing the wire rope in two: the undamaged portion may continue to be used. Joining lengths of wire rope by splicing is prohibited.

- If the qualified person determines that, although not currently a safety hazard, the deficiency needs to be monitored, the manager (or his/her designee) shall confirm that the deficiency is checked in the monthly inspections.

- The inspection shall be documented in accordance with this procedure.

4.5.3 Do not use rope lubricants that are of the type that hinder inspection.

4.6 Wire Rope – Selection and Installation Criteria

4.6.1 Select replacement wire rope in accordance with the requirements of this section, and the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person.

4.6.2 Boom-hoist reeving

- Do not use fiber core ropes for boom-hoist reeving, except for derricks.
- Use rotation-resistant ropes for boom-hoist reeving only where the requirements of 4.6.3 below are met.

4.6.3 Rotation-resistant ropes

- Definitions
  - Type I rotation-resistant rope is stranded rope constructed to have little or no tendency to rotate; or, if guided, transmits little or no torque. It has at least 15 outer strands and comprises an assembly of at least three layers of strands laid helically over a center in two operations. The direction of lay of the outer strands is opposite to that of the underlying layer.
  - Type II rotation-resistant rope is stranded rope constructed to have significant resistance to rotation. It has at least 10 outer strands and comprises an assembly of two or more layers of strands laid helically over a center in two or three operations. The direction of lay of the outer strands is opposite to that of the underlying lay.
- Requirements
  - Do not use Types II and III with an operating design factor of less than five for duty cycle or repetitive lifts.
  - Use rotation-resistant ropes (including Types I, II, and III) with an operating design factor of no less than 3.5.
  - Type I shall have an operating design factor of no less than five, except where the wire rope manufacturer and the equipment manufacturer approves the design factor, in writing.
  - Types II and III shall have an operating design factor of no less than five, except where the requirements of this section are met, as listed below.
- When Types II and III with an operating design factor of less than five are used (for non-duty cycle, non-repetitive lifts), the following requirements shall be met for each lifting operation:
  - A qualified person shall inspect the rope in accordance with this procedure. The rope may be used only if the qualified person determines that there are no deficiencies constituting a hazard. In making this determination, more than one broken wire in any one rope lay will be considered a hazard.
  - Conduct operations in such a manner and at such speeds as to minimize dynamic effects.

- Each lift made under these provisions will be recorded in the monthly and annual inspection documents. Such prior uses will be considered by the qualified person in determining whether to use the rope again.

- Additional requirements
  - Do not use rotation-resistant ropes for boom-hoist reeving, except where the requirements of this section are met, as listed below.
  - Rotation-resistant ropes may be used as boom-hoist reeving when load hoists are used as boom hoists for attachments such as luffing attachments or boom and mast attachment systems. Under these conditions, the following requirements shall be met:
    - The drum shall provide a first-layer rope-pitch diameter of not less than 18 times the nominal diameter of the rope used.
    - The requirements in this standard (regardless of the date of manufacture of the equipment).
    - The requirements in ASME B30.5-2007, Section 5-1.3.2(a), (a)(2) through (a)(4), (b) and (d), except that the minimum pitch diameter for sheaves used in multiple-rope reeving is 18 times the nominal diameter of the rope used, instead of the value of 16 specified in Section 5-1.3.2(d).
    - All sheaves used in the boom-hoist reeving system shall have a rope-pitch diameter of not less than 18 times the nominal diameter of the rope used.
    - The operating design factor for the boom-hoist reeving system cannot be less than 5.
    - The operating design factor for these ropes will be the total minimum breaking force of all parts of rope in the system divided by the load imposed on the rope system when supporting the static weights of the structure, and the load within the equipment's rated capacity.
    - When provided, a power-controlled lowering system shall be capable of handling rated capacities and speeds as specified by the manufacturer.

4.6.4 Socketing will be done in the manner specified by the manufacturer of the wire rope or fitting.

4.6.5 Prior to cutting a wire rope, place seizings on each side of the point to be cut. The length and number of seizings will be in accordance with the wire-rope manufacturer's instructions.

4.7 Safety Devices

4.7.1 This section does not apply to side-boom cranes.

4.7.2 The following safety devices are required on all equipment covered by this procedure, unless otherwise specified:

- Crane-level indicator
  - The equipment will have a crane-level indicator that is either built into the equipment or is available on the equipment.
  - If a built-in crane-level indicator is not working properly, it will be tagged-out or removed.
  - This requirement does not apply to portal cranes, derricks, floating cranes/derricks, and land cranes/derricks on barges, pontoons, vessels, or other means of flotation
- Boom stops, except for derricks and hydraulic booms.
- Jib stops (if jib is attached), except for derricks.
- Equipment with foot-pedal brakes will have locks, except for portal cranes and floating cranes.

- Hydraulic outrigger jacks will have an integral holding device/check valve.
- Equipment on rails will have rail clamps and rail stops, except for portal cranes.

4.7.3 Proper Operation Required

- Operations may not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator will safely stop operations. Do not resume operations until the device is working properly. Alternative measures are not permitted to be used.

4.8 Operational Aids for Mobile and Locomotive Cranes

4.8.1 This section does not apply to side-boom cranes.

4.8.2 Consult standards and regulations for the given jurisdiction for any applicable requirements concerning operational aids, including but not limited to:

- Two-blocking features
- Load indicators, rated capacity indicators, and rated capacity limiters
- Boom angle or radius indicator
- Boom-hoist disconnect, shut-off, or hydraulic relief
- Boom-length indicator
- Crane-level indicator
- Drum-rotation indicator.

4.9 Operational Aids for Tower Cranes

4.9.1 Do not begin operations unless the operational aids are in proper working order, except where the manager (or his/her designee) meets the specified temporary alternative measures. Follow more protective alternative measures specified by the tower crane manufacturer, if any.

4.9.2 If an operational aid stops working properly during operations, the operator will safely stop operations until the temporary alternative measures are implemented or the device is again working properly. If a replacement part is no longer available, the use of a substitute device that performs the same type of function is permitted, and is not considered a modification under this procedure.

4.9.3 Category I operational aids and alternative measures. Operational aids listed in this paragraph that are not working properly shall be repaired no later than 7 days after the deficiency occurs. Exception: If the manager (or his/her designee) documents that he/she has ordered the necessary parts within 7 days of the occurrence of the deficiency, the repair will be completed within 7 days of receipt of the parts.

- Trolley-travel–limiting device. Restrict the travel of the trolley at both ends of the jib by a trolley-travel–limiting device to prevent the trolley from running into the trolley end-stops. Temporary alternative measures:
  - Option A. Mark the trolley rope (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the trolley prior to the end-stops.
  - Option B. Use a spotter when operations are conducted within 10 feet (3 meters) of the outer or inner trolley end-stops.
- Boom-hoist–limiting device. Limit the range of the boom at the minimum and maximum radius. Temporary alternative measures: Clearly mark the cable (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the boom within the minimum and maximum boom radius, or use a spotter.

- Anti–two-blocking device. Equip the tower crane with a device that automatically prevents damage from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component). The device(s) shall prevent such damage at all points where two-blocking could occur. As a temporary alternative, measure and clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking; or use a spotter.
- Hoist-drum-lower-limiting device. Equip tower cranes manufactured more than 1 year after the effective date of this procedure with a device that prevents the last two wraps of hoist cable from being spooled off the drum (consult jurisdictional requirements 5 wraps is not uncommon). As a temporary alternative measure, clearly mark the cable so it can be seen by the operator at a point that will give the operator sufficient time to stop the hoist prior to the last two wraps of hoist cable being spooled off the drum, or use a spotter.
- Load-moment–limiting device. Provide the tower crane with a device that prevents moment overloading. As a temporary alternative measure, use a radius-indicating device (if the tower crane is not equipped with a radius-indicating device, measure the radius to confirm the load is within the rated capacity of the crane). In addition, determine the weight of the load from a reliable source such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight, or by other equally reliable means. Provide this information to the operator prior to the lift.
- Hoist-line pull-limiting device. Limit the capacity of the hoist to prevent overloading, including each individual gear ratio if equipped with a multiple-speed hoist transmission. As a temporary alternative measure, the operator will confirm that the weight of the load does not exceed the capacity of the hoist (including for each individual gear ratio if equipped with a multiple-speed hoist transmission).
- Rail-travel–limiting device. Limit the travel distance in each direction to prevent the travel bogies from running into the end stops or buffers. As a temporary alternative measure, use a spotter when operations are conducted within 10 feet of either end of the travel rail end stops.
- Boom-hoist–drum positive locking device. Equip the boom-hoist drum with a device to positively lock the boom-hoist drum. As a temporary alternative measure, manually set the device when required if an electric, hydraulic, or automatic type is not functioning.

4.9.4 Category II operational aids and alternative measures. Repair operational aids listed in this paragraph that are not working properly no later than 30 days after the deficiency occurs. Exception: If the manager (or his/her designee) documents that he/she has ordered the necessary part within 7 days of the occurrence of the deficiency, and the part is not received in time to complete the repair in 30 days, complete the repair within 7 days of receipt of the parts.

- Boom-angle or hook-radius indicator.
    - Confirm luffing boom-tower cranes have a boom-angle indicator readable from the operator's station.
    - Confirm hammerhead tower cranes manufactured more than 1 year after the effective date of this subpart have a hook-radius indicator readable from the operator's station.
    - Temporary alternative measure: Determine hook radii or boom angle by measuring the hook radii or boom angle with a measuring device.
- Trolley-travel deceleration device. The trolley speed will be automatically reduced prior to the trolley reaching the end limit in both directions. Temporary alternative measure: the operator will reduce the trolley speed when approaching the trolley end limits.
- Boom-hoist deceleration device. The boom speed will be automatically reduced prior to the boom reaching the minimum or maximum radius limit. Temporary alternative measure: the operator will reduce the boom speed when approaching the boom maximum or minimum end

limits.

- Load-hoist deceleration device. The load speed will be automatically reduced prior to the hoist reaching the upper limit. Temporary alternative measure: the operator will reduce the hoist speed when approaching the upper limit.
- Wind-speed indicator. Provide a device to display the wind speed, and mount above the upper rotating structure on tower cranes. On self-erecting cranes, mount at or above the jib level. Temporary alternative measure: use wind-speed information from a properly functioning indicating device on another tower crane on the same site; or have a qualified person estimate the wind speed.
- Load-indicating device. Cranes manufactured more than 1 year after the effective date of this procedure shall have a device that displays the magnitude of the load on the hook. Displays that are part of load-moment–limiting devices that display the load on the hook meet this requirement.
- Temporary alternative measures: Determine the weight of the load from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight); or by other equally reliable means. Provide his information to the operator prior to the lift.

4.10 Crane Operator Qualifications

4.10.1 This section does not apply to side-boom cranes.

4.10.2 Operators of cranes shall hold a valid certification or license for the equipment operation (Crane and Hoist Equipment) issued by an accredited testing organization, a government licensing entity or an apprenticeship and accredited testing organization, as required by the appropriate jurisdictional regulatory body.

- Requirements for obtaining the applicable jurisdiction's license or certification shall include assessment, by written and practical tests, of the operator's ability and knowledge, including, but not limited to:
    - The controls and operational/performance characteristics.
    - Use of, and the ability to calculate (manually or with a calculator), load/capacity information on a variety of configurations of the equipment.
    - Procedures for preventing and responding to power line contact.
    - Technical knowledge applicable to the specific type of equipment the individual will operate.
    - Technical knowledge applicable to:
        - The suitability of the supporting ground and surface to handle expected loads.
        - Site hazards.
        - Site access.
    - Ability to recognize, from visual and audible observation, the items listed in shift inspection.
    - Operational and maneuvering skills.
    - Application of load chart information.
    - Application of safe shut-down and securing procedures.
- Licensing or certification shall be renewed as specified by the applicable jurisdiction and licensing/certifying body.

- Appropriate legislation and apprenticeship boards shall be consulted to confirm compliance.

4.10.3 NOTE: If certification is not required and not available for a given jurisdiction for the equipment to be operated, verification of operator competency shall be documented (e.g. dependent upon jurisdiction: Boom Truck with lifting capacity less than 4.5 tonne (5 ton), Side Boom, etc.)

4.10.4 Apprentice operators/operators in training shall be registered, if applicable, with a recognized apprenticeship and accredited testing organization applicable to the jurisdiction in which the work is being conducted.

- Exemptions and subsequent requirements may apply.
- Appropriate legislation, apprenticeship boards and or accredited testing organizations shall be consulted to confirm compliance.
- Apprentice operators/operators in training shall work under the direct supervision of an authorized, competent certified crane operator. AECOM managers shall confirm the authorized worker performing direct supervision is competent, well trained in the operation of the particular lifting device, certified and capable of performing the required work.
    - For equipment other than tower cranes, the authorized worker performing direct supervision and the trainee/apprentice shall be in direct line of sight of each other, and will communicate verbally or by hand signals. For tower cranes, the authorized worker and the trainee/apprentice will be in direct communication with each other.
    - The trainee/apprentice shall be supervised by the operator's supervisor at all times, except for short breaks where the following are met:
        - The break lasts no longer than 15 minutes and there is no more than 1 break per hour.
        - Immediately prior to the break, the authorized worker performing direct supervision informs the trainee/apprentice of the specific tasks that the trainee/apprentice is to perform, and limitations that he/she is to adhere to during the authorized worker's break.
        - The specific tasks that the trainee/apprentice will perform during the authorized worker's break are within the trainee/apprentice's abilities.
    - The trainee/apprentice may not operate the equipment in any of the following circumstances:
        - If any part of the equipment, load line, or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get within the minimum approach distance of an overhead power line.
        - The equipment is used to hoist personnel.
        - The equipment is used over a shaft, cofferdam, or in a tank farm.
        - For multiple-lift rigging, except where the authorized worker performing direct supervision determines that the trainee's/apprentice's skills are sufficient for this high-skill work
- All training of all apprentices or other uncertified operators shall be approved by the program or manager

4.10.5 For critical lifts, only crane operators certified to the appropriate jurisdictional standards and proven competent in the operation of the specific crane used in the lift may operate the crane.

4.10.6 WARNING: No apprentice operator/operator in training shall be permitted to operate any crane involved in a lift without sufficient prior training and direct, competent supervision appropriate to the equipment operated UNLESS jurisdictional standards permit otherwise.

4.10.7 The crane operator shall be qualified to use and be familiar with the hoisting equipment to be operated; otherwise sufficient time and instruction to adequately inspect and test the equipment shall be given.

4.10.8 The operator sahll be able to perform and document, in a crane logbook, daily pre-operational maintenance checks to confirm the equipment can safely handle all loads. Crane operators shall have a general working knowledge of relevant safety codes and standards applicable to the operation of the given crane.

4.11 Signal Person Qualification

4.11.1 The manager (or his/her designee) of the signal person shall confirm that each signal person meets the qualification requirements prior to giving any signals. This requirement will be met by using either of the following options:

- Option 1 – Third-party–qualified evaluator: The signal person has documentation from a third-party qualified evaluator showing that the signal person meets the Qualification Requirements.
- Option 2 – Manager's (or his/her designee's) qualified evaluator: The manager (or his/her designee) has his/her qualified evaluator assess the individual and determine that the individual meets the Qualification Requirements and provides documentation of that determination. An assessment by a manager's (or his/her designee's) qualified evaluator under this option is not portable – other managers (or their designees) are not permitted to use it to meet the requirements of this section.
- The documentation for whichever option is used will be available while the signal person is employed by the manager (or his/her designee).

4.11.2 If subsequent actions by the signal person indicate that the individual may not meet the Qualification Requirements, the manager (or his/her designee) shall not allow the individual to continue working as a signal person until retraining is provided and a reassessment is conducted, which confirms that the individual meets the Qualification Requirements.

4.11.3 Qualification Requirements. Each signal person shall:

- Know and understand the type of signals used. If hand signals are used, the signal person shall know and understand the Standard Method for hand signals. Refer to *S3AM-310-ATT2 Standard Hand Signals.*
- Be competent in the application of the type of signals used.
- Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads, and boom deflection from hoisting loads.
- Know and understand the relevant requirements of this procedure.
- Demonstrate that he/she meets the requirements of this section through a verbal or written test and through a practical test.
- Be familiar with working around Heavy equipment as outlined in *S3AM-309-PR1 Heavy Equipment*.

4.12 Rigger Qualification

4.12.1 Personnel shall be trained in the selection of rigging, inspection, cautions to personnel, effects of the environment, and rigging practices.

- Refer to *S3AM-310-ATT3 Rigging*.

4.13 Maintenance and Repair Workers' Qualifications

Maintenance, inspection, and repair personnel are permitted to operate the equipment only if the following requirements are met:

4.13.1 The operation is limited to those functions necessary to perform maintenance, and to inspect or verify the performance of the equipment.

4.13.2 The personnel either:

- Operate the equipment under the direct supervision of an operator who meets the requirements of Section 4.10 Crane Operator Qualifications of this procedure; or
- Are familiar with the operation, safe limitations, characteristics, and hazards associated with the type of equipment.

4.13.3 Maintenance and repair personnel shall meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.

4.14 Overhead Power Line Safety

4.14.1 Before assembling or disassembling of a crane or operation of a crane, the manager (or his/her designee) shall determine if any part of the assembly / disassembly equipment, crane, load line, or load (including rigging and lifting accessories) could get closer than 50 feet (15.25 meters) to an power line during the assembly/disassembly process or during crane operation.

4.14.2 The manager (or his/her designee) shall assume that all power lines are energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.

- The overhead power line owner/operator (e.g. local utility company) shall be contacted to determine the voltage of the overhead line and establish the appropriate minimum approach distance (MAD). Assembly/disassembly and crane operation inside the MAD is prohibited. Work or equipment operation closer than the MAD specified by regulation is only permitted when the following requirements are met:
    - The manager (or his/her designee) determines that it is infeasible to do the work without breaching the minimum approach distance as specified by regulatory requirements.
    - The manager (or his/her designee) determines that, after consultation with the utility owner/operator, it is infeasible to de-energize and ground the power line or relocate the power line.
    - The power line owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution determines the specific MAD that shall be maintained to prevent electrical contact in light of the on-site conditions. The factors that shall be considered in making this determination include, but are not limited to:
        - Conditions affecting atmospheric conductivity;
        - Time necessary to bring the equipment, load line, and load (including rigging and lifting accessories) to a complete stop;
        - Wind conditions;
        - Degree of sway in the power line;
        - Lighting conditions; and
        - Conditions affecting the ability to prevent electrical contact.
    - A planning meeting with the manager (or his/her designee) and utility owner/operator (or a qualified person with respect to electrical power transmission and distribution) is held to determine the procedures that will be followed to prevent electrical contact and electrocution.
    - Procedures shall be documented, reviewed with affected personnel and be immediately

available on-site.

- No part of a crane/derrick, load line, or load (including rigging and lifting accessories), whether partially or fully assembled, is allowed within the MAD unless the manager (or his/her designee) has confirmed that the utility owner/operator has de-energized and visibly grounded the power line (at the worksite).
- Work below an energized power line is permitted only if the manager confirms the uppermost part of the equipment (including those equipped with an extensible boom in the fully extended position at true vertical) could not encroach on the MAD.

4.14.3 Refer to *S3AM-322-PR1 Overhead Lines* for additional requirements.

4.14.4 The location of the power line(s), and the steps that will be implemented to prevent encroachment/electrocution (e.g. barricades, insulators, signal person, proximity alarms, warning lines, etc.) shall be included in the SH&E Plan and THA. This information shall be reviewed and communicated to affected personnel in the tailgate or specific pre-lift meeting.

4.14.5 There shall be at least one electrocution hazard warning conspicuously posted in the crane cab so that it is in view of the operator and tower(except for overhead gantry).

4.14.6 Use only non-conducive tag lines.

4.14.7 When working near transmitter/communication towers where the equipment is close enough for an electrical charge to be induced in the equipment or materials being handled, the transmitter will be de-energized, or the following precautions will be taken when necessary to dissipate induced voltages:

- Provide the equipment with an electrical ground.
- Use non-conductive rigging or an insulating link/device.

4.14.8 Overhead Power Line Safety Training

- Train operators and crew assigned to work with the equipment on the following:
  - The procedures to be followed in the event of electrical contact with a power line, including:
    - Information regarding the danger of electrocution from the operator simultaneously touching the equipment and the ground.
    - The importance to the operator’s safety of remaining inside the cab, except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
    - The safest means of evacuating from equipment that may be energized.
    - The danger for the potentially energized zone around the equipment.
    - The need for crew in the area to avoid approaching or touching the equipment.
    - Safe clearance distance from power lines.
  - Power lines are presumed to be energized unless the utility owner/operator confirms that the power line has been and continues to be de-energized and visibly grounded at the worksite.
  - Power lines are presumed to be un-insulated unless the utility owner/operator or a registered engineer who is a qualified person with respect to electrical power transmission and distribution confirms that a line is insulated.
  - The limitations of an insulating link/device, proximity alarm, and range control (and similar) device, if used.

- Train persons working as dedicated spotters to enable them to effectively perform their task, including training on the applicable requirements of this section.

4.14.9 Devices originally designed by the manufacturer for use as:

- A safety device, operational aid, or a means to prevent power line contact or electrocution, when used to comply with this section, shall meet the manufacturer's procedures for use and conditions of use.

4.15 Equipment Modifications

4.15.1 Modifications or additions that affect the capacity or safe operation of the equipment are prohibited except where the requirements listed below apply.

4.15.2 Manufacturer's review and approval

- The manufacturer approves the modifications/additions in writing.
- The load charts, procedures, instruction manuals, and instruction plates/tags/decals are modified as necessary to accord with the modification/addition.
- The original safety factor of the equipment is not reduced.

4.15.3 Unavailable manufacturer.

- If the manufacturer is unavailable, modifications or additions shall only be c the direction of a qualified person (e.g. professional engineer).
- The load charts, procedures, instruction manuals, and instruction plates/tags/decals are modified at the direction of the qualified person and as necessary to accord with the modification/addition.

4.16 Assembly/Disassembly of Cranes

4.16.1 Supervision

- Assembly/disassembly shall be supervised by a person who meets the criteria for both a competent person and a qualified person, or by a competent person who is assisted by one or more qualified persons (assembly / disassembly [A/D] supervisor). The A/D supervisor shall be experienced in working with the make and model of equipment being assembled or disassembled.
- Where the assembly/disassembly is being performed by only one person, that person shall meet the criteria for both a competent person and a qualified person; an A / D supervisor.

4.16.2 Knowledge of procedures

- The A/D supervisor shall understand the applicable assembly/disassembly procedures.

4.16.3 Review of procedures

- The A/D supervisor shall review the applicable assembly/disassembly procedures, Pre-Job Hazard Assessment, Task Hazard Assessment (THA) for each task, or a written Assembly/Disassembly Procedure (Refer to *S3AM-310-FM12 Assembly - Disassembly Procedure*).
- This review will be completed immediately prior to the commencement of assembly/disassembly, unless the A/D supervisor has applied them to the same type and configuration of equipment (including accessories, if any) so that they are already known and understood.

4.16.4 Develop crew instructions for assembly/disassembly operation by using the minimum of a JSA for each task to be performed.

- Before commencing assembly/disassembly operations, during assembly/disassembly operations, before a crew member takes on a different task, or when adding new personnel during the operations the A/D supervisor shall determine that the crew members understand the following:
    - Their tasks;
    - The hazards associated with their tasks; and
    - The hazardous position/locations that they need to avoid.

4.16.5 Protecting assembly/disassembly crew members out of operator view

- Before a crew member goes to a location that is out of view of the operator and is either in, on, under, or near the equipment (or load) where the crew member could be injured by movement of the equipment (or load), the crew member shall inform the operator that he/she is going to that location.
    - Where the crane operator knows that a crew member went to one of the above mentioned locations, the operator will not move any part of the equipment (or load) until the operator is informed in accordance with a pre-arranged system of communication that the crew member is in a safe position.

4.16.6 Working under the boom, jib, or other components

- When pins (or similar devices) are being removed, workers shall not be under the boom, jib, or other components, except where:
    - The manager (or his/her designee) demonstrates that site constraints require one or more workers to be under the boom, jib, or other components when pins (or similar devices) are being removed, the A/D supervisor shall implement procedures that minimize the risk of unintended dangerous movement, and minimize the duration and extent of exposure under the boom.

4.16.7 Capacity limits. During all phases of assembly/disassembly, rated capacity limits for loads imposed on the equipment, equipment components (including rigging), lifting lugs, and equipment accessories shall not be exceeded for the equipment being assembled/disassembled.

4.16.8 Addressing specific hazards. The A/D supervisor shall address the hazards associated with the operation with methods to protect the workers from them, as follows:

- Site and ground-bearing conditions. Site and ground conditions shall be adequate for safe assembly/disassembly operations and to support the equipment during assembly/disassembly.
- Blocking material. The size, amount, condition, and method of stacking blocking shall be sufficient to sustain the loads and maintain stability.
- Proper location of blocking. When used to support lattice booms or components, blocking shall be appropriately placed to:
    - Protect the structural integrity of the equipment; and
    - Prevent dangerous movement and collapse.
- Verifying assist crane loads. When using an assist crane, the loads that will be imposed on the assist crane at each phase of assembly/disassembly shall be verified before assembly/disassembly begins, in order to prevent exceeding rated capacity limits for the assist crane.
- Boom and jib pick points. The point(s) of attachment of rigging to a boom (or boom sections, or jib or jib sections) shall be suitable for preventing structural damage and facilitating safe handling of these components.

- Center of gravity
    - Identify the center of gravity of the load if necessary for the method used for maintaining stability.
    - Where there is insufficient information to accurately identify the center of gravity, use measures designed to prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity.
- Stability upon pin removal. Rig or support the boom sections, boom suspension systems (such as gantry A-frames and jib struts), or components to maintain stability upon the removal of the pins.
- Snagging. Do not allow suspension ropes and pendants to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).
- Struck by counterweights. Prevent the potential for unexpected movement from inadequately supported counterweights and from hoisting counterweights.
- Boom-hoist brake failure. Where reliance is placed on the boom-hoist brake to prevent boom movement during assembly/disassembly, the brake will be tested to determine if it is sufficient to prevent boom movement. If it is not sufficient, a boom hoist pawl, other locking device/back-up braking device, or another method of preventing dangerous movement of the boom (such as blocking or using an assist crane) from a boom-hoist brake failure will be used.
- Loss of backward stability. Consider backward stability before swinging the upper works, travel, and the attaching or removing equipment components.
- Wind speed and weather. Consider wind speed and weather so that the safe assembly/disassembly of the equipment is not compromised.

4.16.9 Cantilevered boom sections. Do not exceed manufacturer's limitations on the maximum amount of boom supported only by cantilevering. When such limitations are not available, a registered professional engineer familiar with the type of equipment involved will determine this limitation in writing: this limit shall not be exceeded.

4.16.10 Weight of components. The weight of the components shall be readily available.

4.16.11 Components and configuration

- The selection of components and configuration of the equipment that affects the capacity or safe operation of the equipment shall be in accordance with:
    - Manufacturer's instructions, limitations, and specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved shall approve, in writing, the selection and configuration of components; or
    - Approved modifications that meet the equipment requirements.
- Post-assembly inspection. Upon completion of assembly, inspect the equipment to confirm compliance with the AECOM initial and annual crane inspection and load testing.

4.16.12 Manufacturer's prohibitions. The manager (or his/her designee) shall comply with applicable manufacturer's prohibitions.

4.16.13 Shipping pins. Remove reusable shipping pins, straps, links, and similar equipment, and store so that they do not present a falling-object hazard.

4.16.14 Pile driving. Equipment used for pile driving shall not have a jib attached during pile-driving operations.

4.16.15 Outriggers. When the load to be handled and the operating radius require the use of outriggers, or at any time when outriggers are used, the following requirements shall be met:

- The outriggers shall be either fully extended; or, if the manufacturer's procedures permit, deployed as specified in the load chart.
- The outrigger shall be set with the machine-supported level, on fully extended outriggers with all tires free of the supporting surface (clear of the surface), except for locomotive cranes (see paragraph 15.f of this section for use of outriggers on locomotive cranes).
- When outrigger floats are used, they shall be attached to the outriggers.
- Each outrigger shall be visible to the operator or to a signal person during extension and setting.
- Outrigger blocking shall:
    - Meet the requirements in paragraphs 8.b and 8.c of this section.
    - Be placed only under the outrigger float, and/or the outrigger jack. Where the outrigger is designed without a jack, the blocking shall be placed under the outer bearing surface of the extended outrigger beam.
- For locomotive cranes, when using outriggers to handle loads, the manufacturer's procedures shall be followed. When lifting loads without using outriggers, the manufacturer's procedures will be met regarding truck wedges or screws.

4.16.16 Assembly/Disassembly – Additional Requirements for Booms and Jibs

- Do not remove any of the pins in the pendants (partly or completely) when the pendants are in tension.
- Do not remove any of the pins (top and bottom) on boom sections located between the uppermost boom section and the crane/derrick body (partly or completely) when the boom is being supported by the uppermost boom section resting on the ground (or other support).
- Do not remove any of the top pins on boom sections located on the cantilevered portion of the boom being removed (the portion being removed ahead of the pendant attachment points) (partly or completely) until the cantilevered section to be removed is fully supported.

4.16.17 Assembly/Disassembly – Manager Procedures

- When using the manager's (or his/her designee's) procedures instead of the manufacturer's procedures for assembling or disassembling, the manager (or his/her designee) shall confirm that the procedures are designed to:
    - Prevent unintended dangerous movement, and prevent collapse of all parts of the equipment.
    - Provide adequate support and stability of all parts of the equipment during the assembly/disassembly process.
    - Position workers involved in the assembly/disassembly operation so that their exposure to unintended movement or collapse of part or all of the equipment is minimized.
- Manager's procedures shall be developed by a qualified person.

4.17 Operation

4.17.1 The manager (or his/her designee) will comply with all the manufacturer's procedures applicable to the operational functions of equipment, including its use with attachments. The manager (or his/her designee) should consider the use of equipment that has all the manufacturer's procedures and information available during the planning stages of the project.

4.17.2 Unavailable Operation Procedures

- Where the manufacturer's procedures are unavailable, the manager (or his/her designee) will develop and confirm compliance with all procedures necessary for the safe operation of the equipment and attachments.
- Procedures for the operational controls shall be developed by a qualified person.
- Procedures related to the capacity of the equipment shall be developed and signed by a registered professional engineer familiar with the equipment.

4.17.3 Operational procedures

- All cranes arriving on site require pre-inspection, initial and annual inspections, load test, and verification of operator qualifications.
- Prior to operation of crane on site, conduct pre-lift planning in accordance *with S3AM-310-FM2 Lift Classification* or assembly/disassembly procedures. Refer to *S3AM-310-FM12 Assembly – Disassembly Procedure.*
- Equipment set-up.
    - Confirm the equipment will be uniformly level, within 1 percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.
    - Equipment with outriggers shall have all outriggers extended and locked. The amount of extension shall be the same for all outriggers, and in accordance with the manufacturer's procedures and load charts.
- Procedures related to the capacity of the equipment shall be developed and signed by a registered professional engineer familiar with the equipment.

4.17.4 Accessibility of procedures

- The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, shall be readily available in the cab at all times for use by the operator.
- Where rated capacities are available in the cab only in electronic form: in the event of a failure that makes the rated capacities inaccessible, the operator shall immediately cease operations or follow safe shut-down procedures until the rated capacities are available.

4.17.5 The operator shall not engage in any practice that diverts his/her attention while actually engaged in operating the crane, such as the use of cell phones (other than when used for signal communications) or other attention-diverting activities.

4.17.6 Leaving the equipment unattended

- The operator shall not leave the controls while the load is suspended, except where permitted by the applicable jurisdiction and the following are met:
    - The operator remains adjacent to the equipment and is not engaged in any other duties.
    - The load is to be held suspended for a period of time exceeding normal lifting operations.
    - The competent person determines that it is safe to do so, and implements measures necessary to restrain the boom hoist and telescoping, load, swing, and outrigger functions.
    - Barricades or caution lines (and notices) are erected to prevent all workers from entering the fall zone. Do not permit workers in the fall zone.
- The provisions of this section do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the load is not suspended over an entrance or exit.

4.17.7 Tag-Out

- Where the manager (or his/her designee) has taken the equipment out of service, a tag shall be placed in the cab stating that the equipment is out of service and is not to be used. Where the manager (or his/her designee) has taken a function(s) out of service, a tag shall be placed in a conspicuous position stating that the function is out of service and is not to be used.
- Response to “Do Not Operate” tag-out signs
    - If there is a warning (tag-out or maintenance/do not operate) sign on the equipment or starting control, the operator shall not activate the switch or start the equipment until the sign has been removed by a management person authorized to remove it.
    - An inspection of the entire area shall be completed, and all attempts shall be made to locate the person who applied the tag or lock prior to any actions. If the person who applied the tag or lock cannot be located, the following steps shall be adhered to. Management shall determine that:
        - No one is servicing, working on, or otherwise in a dangerous position on the machine.
        - The equipment has been repaired and is working properly.

4.17.8 Before starting the engine, the operator shall verify that all controls are in the proper starting position and that all personnel are in the clear.

4.17.9 When a local storm warning has been issued, the competent person will determine whether it is necessary to implement manufacturer’s recommendations for securing the equipment.

4.17.10 The operator shall be familiar with the equipment and its proper operation. If adjustments or repairs are necessary, the operator shall promptly inform the person designated by the manager to receive such information; and, where there are successive shifts, inform the next operator.

4.17.11 In all cases verified weights, measured radii, and manufacturer’s loads and capacity chart/capacities and instructions will take precedence over operational aids when handling a load.

4.17.12 If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, it will be verified (before starting to lift) that the rope is seated on the drum and in the sheaves as the slack is removed.

4.17.13 The competent person will consider the effect of wind, ice, and snow on equipment stability and rated capacity. Crane Manufacturers Operators Manual should be referenced to determine the wind speed and temperature restrictions that apply to each specific crane.

4.17.14 Compliance with rated capacity

- Do not operate the equipment in excess of its rated capacity.
- The operator will verify that the load is within the rated capacity of the equipment by at least one of the following methods:
    - The weight of the load will be determined from a reliable source (such as the load’s manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight), or by other equally reliable means. In addition, when requested by the operator, this information will be provided to the operator prior to the lift; or
    - The operator will begin hoisting the load to determine—using a load-weighing device—load-moment indicator, rated-capacity indicator, or rated-capacity limiter, if it exceeds 75 percent of the maximum rated capacity at the longest radius that will be used during the lift operation. If it does, the operator will not proceed with the lift until management verifies the weight of the load.

4.17.15 The boom or other parts of the equipment shall not contact any obstruction.

4.17.16 Do not use the equipment to drag or pull loads sideways.

4.17.17 On wheel-mounted equipment, do not lift loads over the front area, except as permitted by the manufacturer.

4.17.18 The operator will test the brakes each time a load that is 90 percent or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each lift is 90 percent or more of the maximum line pull, this requirement applies to the first lift, but not to successive lifts.

4.17.19 Do not lower the load or the boom below the point where less than two full wraps of rope remain on their respective drums.

4.17.20 Traveling with a load.

- Traveling with a load is prohibited if the practice is prohibited by the manufacturer.
- Where traveling with a load, the manager (or his/her designee) will confirm that:
    - A competent person supervises the operation, determines if it is necessary to reduce rated capacity, and makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to confirm safety.
    - The determinations of the competent person are implemented.
    - For equipment with tires, maintain tire pressure specified by the manufacturer.

4.17.21 Rotational speed of the equipment shall be such that the load does not swing out beyond the radius at which it can be controlled.

4.17.22 A tag or restraint line shall be used if necessary to prevent rotation of the load that would be hazardous.

4.17.23 Adjust the brakes in accordance with the manufacturer's procedures to prevent unintended movement.

4.17.24 The operator shall obey a stop (or emergency stop) signal, irrespective of who gives it.

4.17.25 A locomotive crane shall not be swung into a position where it is reasonably foreseeable that railway cars on an adjacent track could strike it, until it is determined that cars are not being moved on the adjacent track, and that proper flag protection has been established.

4.17.26 Counterweight/Ballast

- The following applies to equipment other than tower cranes:
    - Do not operate equipment without the counterweight or ballast in place, as specified by the manufacturer.
    - Do not exceed the maximum counterweight or ballast specified by the manufacturer for the equipment.

4.17.27 Authority to Stop Operation

- Whenever there is a safety concern, the operator or any other workers associated with the operation have the authority to stop, and refuse to handle loads until a qualified person has determined that safety has been assured. Refer to *S3AM-002-PR1 Stop Work Authority*.

4.18 Swing Radius Hazards

4.18.1 The requirements in paragraph 2 of this section apply where there are accessible areas in which the equipment's rotating superstructure (whether permanently or temporarily mounted) poses a reasonably foreseeable risk of:

- Striking and injuring a worker; or

- Pinching/crushing a worker against another part of the equipment or another object.

4.18.2 To prevent workers from entering these hazard areas, the manager (or his/her designee) shall:

- Instruct workers assigned to work on or near the equipment (authorized personnel) in how to recognize struck-by and pinch/crush hazards areas posed by the rotating superstructure.
- Erect and maintain control lines, warning lines, railings, or similar barriers to mark the boundaries of the hazard areas. Exception: where it is neither feasible to erect such barriers on the ground nor on the equipment, the hazards areas shall be clearly marked by a combination of warning signs and high-visibility markings on the equipment that identify the hazard areas. In addition, the manager (or his/her designee) shall train the workers to understand what these markings signify.

4.18.3 Protecting Workers in the Hazard Area

- Before a worker goes to a location in the hazard area out of view of the operator, the worker (or someone instructed by the worker) shall confirm the operator is informed of the area out of the view where the worker will be present.
- Where the operator knows that a worker went to a location out of his/her view, the operator will not rotate the superstructure until the operator:
    - Is informed in accordance with a pre-arranged system of communication that the worker is in a safe position.

4.18.4 Multiple Equipment Coordination. Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity shall institute a system to coordinate operations. If there is no controlling entity, the manager (or his/her designee) shall institute such a system.

4.18.5 Keeping Clear of the Load

- Where available, hoisting routes that minimize the exposure of workers to hoisted loads will be used, to the extent consistent with public safety.
- Although the operator is not moving a suspended load, no worker will be within the fall zone, except for workers:
    - Engaged in hooking, unhooking, or guiding a load;
    - Engaged in the initial attachment of the load to a component or structure; or
    - Operating a concrete hopper or concrete bucket.

4.18.6 When workers are engaged in hooking, unhooking, or guiding the load, or in the initial connection of a load to a component or structure and are within the fall zone, the following criteria shall be met:

- Rig the materials being hoisted to prevent unintentional displacement.
- Use hooks with self-closing latches or their equivalent. Exception: “J” hooks are permitted to be used for setting wooden trusses.
- Confirm the materials are rigged by a qualified rigger. Refer to *S3AM-310-ATT3 Rigging.*

4.18.7 Receiving a load. Only workers needed to receive a load will be permitted to be within the fall zone when a load is being landed.

4.18.8 During a tilt-up or tilt-down operation:

- No worker will be directly under the load.
- Only workers essential to the operation will be in the fall zone (but not directly under the load). Note: Boom free-fall is prohibited when a worker is in the fall zone of the boom or load.

4.19 Free-fall and Controlled-Load Lowering

4.19.1 This section does not apply to side-boom cranes in which the boom is designed to free-fall (live boom) that are manufactured prior to January 2009.

4.19.2 Boom and load free-fall prohibitions

- The use of equipment in which the boom is designed to free-fall (live boom) is prohibited in each of the following circumstances:
  - A worker is in the fall zone of the boom or load.
  - A worker is being hoisted.
  - The load or boom is directly over a power line, or over any part of the MAD to each side of the power line.
  - The load is over a shaft.
  - The load is over a cofferdam, except where there are no workers in the fall zone.
  - Lifting operations are taking place in a refinery or tank farm.
- The use of equipment in which the boom is designed to free-fall (live boom) is permitted only where none of the circumstances listed above are present and:
  - The equipment was manufactured prior to October 31, 1984; or
  - The equipment is a floating crane/derrick or a land crane/derrick on a vessel/flotation device.

4.19.3 Preventing boom free-fall. Where the use of equipment with a boom that is designed to free-fall (live boom) is prohibited, the boom hoist shall have a secondary mechanism or device designed to prevent the boom from falling in the event the primary system used to hold or regulate the boom hoist fails, as follows:

- Friction drums; these shall have:
  - A friction clutch and a braking device to allow for controlled boom lowering.
  - A secondary braking or locking device, which is manually or automatically engaged, to back up the primary brake while the boom is held (such as a secondary friction brake or a ratchet and pawl device).
- Hydraulic drums shall have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure.
- Neither clutches nor hydraulic motors will be considered brake or locking devices for purposes of this subpart.
- Hydraulic boom cylinders shall have an integrally mounted holding device.

4.19.4 Preventing uncontrolled retraction. Hydraulic telescoping booms shall have an integrally mounted holding device to prevent the boom from retracting in the event of hydraulic failure.

4.20 Signals – General Requirements

4.20.1 A signal person shall be provided in each of the following situations:

- The point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator.
- When the equipment is traveling, the view in the direction of travel is obstructed.
- Due to site-specific safety concerns, either the operator or the person handling the load determines that it is necessary.

4.20.2 Types of signals. Signals to operators shall be by hand, voice or audible.

- Signals other than hand, voice, or audible signals may be used where the manager (or his/her designee) demonstrates that:
    - The new signals provide communication at least equally effective as voice, audible, or standard method hand signals; or
    - There is a national consensus standard for the new signals.
- The signals used (hand, voice, audible, or new), and means of transmitting the signals to the operator (such as direct line of sight, video, radio, etc.), shall be appropriate for the site conditions.
- During operations requiring signals, the ability to transmit signals between the operator and signal person shall be maintained. If that ability is interrupted at any time, the operator will safely stop operations requiring signals until it is reestablished, and a proper signal is given and understood.
- If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator shall safely stop operations. Operations may not resume until the operator and signal person agree that the problem has been resolved.
- Only one person gives signals to a crane/derrick at a time, however anyone who becomes aware of a safety problem shall alert the operator or signal person by giving the stop or emergency stop signal. Note that this procedure requires the operator to obey any stop or emergency stop signal.
- All directions given to the operator by the signal person shall be given from the operator's direction perspective.
- Communication with multiple cranes/derricks. Where a signal person(s) is in communication with more than one crane/derrick, a system for identifying which crane/derrick each signal is for shall be used, as follows:
    - For each signal, prior to giving the function/direction, the signal person will identify the crane/derrick the signal is for; or
    - An equally effective method of identifying which crane/derrick the signal is for shall be used.
- Signals – Radio, Telephone, or other Electronic Transmission
    - Test the device(s) used to transmit signals on site before beginning operations to confirm that the signal transmission is clear and reliable.
    - Signal transmission shall be through a dedicated channel. Exception: Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.
    - The operator's reception of signals shall be by a hands-free system.
- Signals – Voice
    - Prior to beginning operations, the operator, signal person, and lift supervisor (if there is one), will contact each other and agree on the voice signals that will be used. Once the voice signals are agreed upon, these workers need not meet again to discuss voice signals unless another worker is substituted; there is confusion about the voice signals; or a voice signal is to be changed.
    - Each voice signal shall contain the following three elements, given in the following order: function (such as hoist, boom, etc.), direction (distance and/or speed); and the 'stop' command.
    - The operator, signal person, and lift supervisor (if there is one), shall be able to effectively

communicate in the language used.

- Signals – Hand Signal Chart
    - Hand signal charts shall either be posted on the equipment or readily available at the site. Refer to *S3AM-310-ATT2 Standard Hand Signals*.
    - Both the operator and the signaler shall be conversant in the standard hand signals.
    - Operators shall only take slow, smooth and decisive signals from a qualified, designated and identifiable signaler.
    - The operator shall obey an emergency stop signal given by any personnel.

4.21 Training

The manager (or his/her designee) shall provide training in accordance with regulatory requirements, certification / licensing requirements and *S3AM-003-PR1 SH&E Training*. As applicable, training may include, but is not limited to:

4.21.1 Overhead power lines.

4.21.2 Signal persons.

4.21.3 Equipment operation.

- Train operators who are not qualified or certified under the conditions within this standard in those areas addressed in this standard. Provide retraining if necessary for re-qualification or re-certification or if the operator does not pass a qualification or certification test.
- Train operators in the following practices:
    - On friction equipment, whenever moving a boom off a support, first raise the boom a short distance (sufficient to take the load off the boom) to determine if the boom hoist brake needs to be adjusted. On other types of equipment, the same practice is applicable, except that typically there is no means of adjusting the brake; if the brake does not hold, a repair is necessary.
    - Where available, the manufacturer's emergency procedures for halting unintended equipment movement.

4.21.4 Competent persons and qualified persons. Train competent persons and qualified persons regarding the requirements of standards and regulations applicable to their respective roles. Refer to *S3AM-202-PR1 Competent Person Designation*.

4.21.5 Crush/pinch points. Instruct workers who work with the equipment to keep clear of holes, and crush/pinch points and the hazards addressed in this procedure (work area control).

4.21.6 Fall Protection

4.21.7 Lock-out /Tag-out. Train operators and other workers authorized to start/energize equipment or operate equipment controls (such as maintenance and repair workers) in the tag-out measures in this procedure.

4.21.8 Training administration

- The manager (or his/her designee) shall confirm that workers required to be trained under this procedure are evaluated to confirm that they understand the information provided in the training.
- Provide refresher training in relevant topics when, based on the conduct of the worker or an evaluation of the worker's knowledge, there is an indication that retraining is necessary

4.22 Critical Lifts

4.22.1 Critical lift identifies loads classified as requiring a formal, written plan.

4.22.2 A critical lift plan shall be developed by an appropriately competent and qualified person or persons and requires review and approval by the involved individuals (e.g. rigging supervisor, crane operator, AECOM manager, etc.).

4.22.3 Critical Lift Plan Requirements

- A Critical Lift Plan consists of as many drawings, specifications, and procedures as necessary to accurately assess all important load factors and site factors relating to a Critical Lift. These items are included as a guide, but should not be interpreted as being all-inclusive in the analysis and preparation of a Critical or Pre-Engineered Lift. Sound engineering and planning is still the responsibility of the engineer and/or project supervisor associated with the lift. Supplemental Information D (Checklist for Lift Planning) summarizes those factors. Most lifts do not involve all of the factors listed there.
- The following is the minimum level of information required for completing an adequate critical lift plan:
    - Elevation View Drawing of the crane, load, and any nearby structures that could cause interference. This drawing shall be made to scale and should note:
        - Crane manufacturer(s), model(s), and counterweight(s), if variable.
        - Boom length(s) and lifting radius.
        - Maximum load elevation during lifting procedure.
        - Any jibs or special lifting devices required.
        - Minimum number of parts of crane hoist line required for lifting the load.
        - All required slings, shackles, and other rigging components identified by capacity, size, length, and location.
        - Calculated center of gravity of load.
    - Plan View Drawing of the crane, load, and nearby structures that could cause interference. This drawing shall be made to scale and should note:
        - Route that transport will take to position the load for lifting.
        - Initial lifting position of the load, including radius. Lifting radius shall be accurately determined.
        - Final placement position of the load, including radius. Lifting radius shall be accurately determined.
        - Location of the crane(s), including tail swing limits.
        - Route that crane(s) will take if walking with the load, as well as associated matting requirements.
        - Any utilities located within the work zone. Underground facilities—piping, ducts, etc.—shall be accurately located.
        - Space may be needed to assemble crane.
        - Planning shall include load transportation considerations, such as how to get the load close enough to the crane. This may be a function of the type of crane being used, because some cranes perform better in certain sectors (quadrants) of operation than others.
    - Lift Analysis, including:

- Tabulation of the gross load weight, including the weight of all blocks and rigging tackle.
- Rigging attachment points and special rigging requirements.
- Gross rated capacity of the crane in the configuration specified.
- Calculation of the percentage of the crane's rated capacity at which the lift will be made.
- Crane-imposed soil loads shall be determined. Soil analysis may be needed to verify crane-imposed loads can be safely supported.
- Allowable weather conditions for the lift, and the effect of wind loading.
- Sequence of work, including lift-off, steady-state conditions, and set-down of load (including positions where there is a shift in the location of the center of gravity, for the pick points).
- Copy of the completed *S3AM-310-FM3 Critical Lift Plan*.
- Copy of crane range diagram.
- Copy of crane load chart.
- Rigging diagram indicating minimum size of slings and shackles.
- Calculation indicating adequacy of rigging.
- Copy of crane outline dimensions.

o All potential complicating issues for any lift shall be addressed in the lift plan; however, for a relatively simple operation, the above items can provide sufficient information, and may even be organized onto one drawing.

4.23 Personnel Hoisting

4.23.1 Hoisting personnel is considered to be a Critical Lift. The requirements of this section are supplemental to the other requirements in this procedure, and apply when one or more workers are hoisted.

4.23.2 All of the following criteria shall be observed and in place prior to any personnel hoisting. Complete *S3AM-310-FM11 Personnel Platform Lifting* along with applicable signatures prior to lifting, as well as any criteria required in the Critical Lifts section of this standard.

4.23.3 Hoisting of personnel shall only be permitted when AECOM can show that the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions.

4.23.4 Hoisting of personnel is always prohibited (even if hoisting personnel is otherwise permitted), when:

- Any part of the equipment would encroach on the MAD of a power line.
- Equipment is traveling unless the equipment travels on fixed rails or the employer can demonstrate that there is no less hazardous way to perform the work. However, when the equipment is a derrick, it may not be used to hoist personnel while traveling under any circumstances.
- The equipment has a rated hoisting/lifting capacity of 2,000 pounds (907 kilograms) or less.

4.23.5 Exceptions: If the use of a personnel platform is not feasible:

- When transferring a worker into and out of drill shafts that are up to and including 8 feet (2.4 meters) in diameter, the worker may be hoisted in a boatswain's chair.

- In pile driving operations, the worker may be hoisted in a boatswain's chair.
- In storage tank (steel or concrete), shaft, and chimney operations, the worker may be hoisted in a boatswain's chair.
- Solely for transfer to or from a marine worksite, the worker may be transported in a marine hoisted-personnel transfer device.
- In addition to the same crane setup and operational requirements for personnel platforms, the following apply to hoisting workers using a boatswain's chair:
    - The boatswain's chair itself (excluding the personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
    - No more than one person will be hoisted at a time.
    - For lattice-boom cranes, the cable shall be clearly marked, so that it can easily be seen by the operator, at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter. If using a boatswain's chair:
    - Worker shall be hoisted in a slow, controlled descent and ascent.
    - The worker shall use personal fall protection equipment, including a full body harness, independently attached to the lower load block or overhaul ball. Refer to *S3AM-304-PR1 Fall Protection*.
    - Station a signal person at shaft openings.
- In addition to the same crane setup and operational requirements for personnel platforms, the following apply to hoisting workers using.
    - The transfer device will be used only for transferring workers.
    - The number of workers occupying the transfer device will not exceed the maximum number it was designed to hold.
    - Each worker shall wear a personal flotation device approved to the appropriate standard for industrial use.

4.23.6 Equipment set-up

- The equipment shall be uniformly level, within 1 percent of level grade, and located on footing that a qualified person has determined to be sufficiently firm and stable.
- Equipment with outriggers shall have them all extended and locked. The amount of extension shall be the same for all outriggers and in accordance with the manufacturer's procedures and load charts.

4.23.7 Equipment criteria

- Capacity – Use of suspended personnel platforms. The total load (with the platform loaded, including the hook, load line, and rigging) will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.
- Capacity – Use of boom-attached personnel platforms. The total weight of the loaded personnel platform will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.
- Capacity – Hoisting personnel without a personnel platform. When hoisting personnel without a personnel platform, the total load (including the hook, load line, rigging and any other equipment that imposes a load) will not exceed 50 percent of the rated capacity for the radius and configuration of the equipment, except during proof testing.

- When the occupied personnel platform is in a stationary working position, the load and boom hoist brakes, swing brakes, and operator-actuated secondary braking and locking features (such as pawls or dogs) or automatic secondary brakes shall be engaged.
- Devices.
    - Equipment (except for derricks) with a variable-angle boom shall be equipped with:
        - A boom angle indicator, readily visible to the operator.
        - A boom hoist limiting device.
    - Equipment with a luffing jib shall be equipped with:
        - A jib angle indicator, readily visible to the operator.
        - A jib hoist limiting device.
    - Equipment with telescoping booms shall be equipped with a device to indicate the boom's extended length clearly to the operator, or have measuring marks on the boom.
    - Anti-two-block. A device that automatically prevents damage and load failure from contact between the load block, overhaul ball, or similar component, and the boom tip (or fixed upper block or similar component) shall be used. The device(s) shall prevent such damage/failure at all points where two-blocking could occur.
    - Controlled load lowering. The load line hoist drum shall have a system, other than the load line hoist brake, that regulates the lowering rate of speed of the hoist mechanism. This system or device shall be used when hoisting personnel. Free-fall of the load line hoist is prohibited. The use of equipment in which the boom hoist mechanism can free-fall is prohibited.
    - Proper operation required. Personnel hoisting operations will not begin unless the devices listed in this section are in proper working order. If a device stops working properly during such operations, the operator shall safely stop operation. Personnel hoisting operations shall not resume until the device is again working properly. Alternative measures are not permitted.
- Direct attachment of a personnel platform to a luffing jib is prohibited.

4.23.8 Personnel platform criteria

- The personnel platform and attachment/suspension system shall be designed for hoisting personnel by a qualified person familiar with structural design.
- The system used to connect the personnel platform to the equipment shall allow the platform to remain within 10 degrees of level, regardless of boom angle.
- The suspension system shall be designed to minimize tipping of the platform due to movement of workers occupying the platform.
- The personnel platform itself (excluding the guardrail system and personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
- All welding of the personnel platform and its components shall be performed by a certified welder familiar with the weld grades, types, and material specified in the platform design, and inspected and certified by a qualified person (e.g. professional engineer).
- Equip the personnel platform with a guardrail system that meets the requirements of *S3AM-304-PR1 Fall Protection*, and is enclosed at least from the toe-board to mid-rail with either solid construction material, or expanded metal having openings no greater than ½ inch (1.27 centimeters). Points to which personal fall arrest systems are attached shall meet the

anchorage requirements as outlined in *S3AM-304-PR1 Fall Protection*.

- Install a grab rail inside the entire perimeter of the personnel platform except for access gates/doors.
- Access gates/doors. If installed, access gates/doors of all types (including swinging, sliding, folding, or other types) will:
    - Not swing outward.
    - Be equipped with a device that prevents accidental opening.
- Confirm headroom is sufficient to allow workers to stand upright in the platform.
- In addition to the use of hard hats, protect workers by overhead protection on the personnel platform when workers are exposed to falling objects.
- All edges exposed to worker contact shall be smooth enough to prevent injury.
- Conspicuously post the weight of the platform and its rated capacity on the platform with a plate or other permanent marking.

4.23.9 Attachment and rigging

- Dedicated rigging: Do not use the rigging used for hoisting personnel for any other hoisting activities such as materials or equipment.
- Rigging hardware (including wire rope, shackles, rings, master links, and other rigging hardware) and hooks shall be capable of supporting, without failure, at least ten times the maximum intended load applied or transmitted to that component.
- Hooks and other detachable devices.
    - Hooks used in the connection between the hoist line and the personnel platform (including hooks on overhaul ball assemblies, lower load blocks, bridle legs, or other attachment assemblies or components) shall be:
        - Of a type that can be closed and locked, eliminating the throat opening.
        - Closed and locked when attached.
    - Shackles used in place of hooks shall be of the alloy anchor type, with either:
        - A bolt, nut, and retaining pin designed for the shackle, in place; or
        - Of the screw type, with the screw pin secured from accidental removal.
    - Where other detachable devices are used, they shall be of the type that can be closed and locked. Such devices shall be closed and locked when attached.
- Rope bridle. When a rope bridle is used to suspend the personnel platform, each bridle leg shall be connected to a master link or shackle in a manner that confirms that the load is evenly divided among the bridle legs.
- Fabricate eyes in wire rope slings with thimbles.
- Use bridles and associated rigging for suspending the personnel platform only for the platform and the necessary workers, their tools, and materials necessary to do their work, and do not use for any other purpose when not hoisting personnel.

4.23.10 Trial lift and inspection

- Make a trial lift with the unoccupied personnel platform loaded at least to the anticipated lift weight from ground level, or any other location where workers will enter the platform, to each location at which the platform is to be hoisted and positioned. Where there is more than one location to be reached from a single set-up position, perform either individual trail lifts for each

location, or a single trail lift for all locations.

- Perform the trial lift immediately prior to each shift in which personnel will be hoisted. In addition, repeat the trial lift prior to hoisting workers in each of the following circumstances:
  - The equipment is moved and set up in a new location or returned to a previously used location.
  - The lift route is changed, unless the competent person determines that the new route presents no new factors affecting safety.
- The competent person shall determine that:
  - Safety devices and operational aids required by this section are activated and functioning properly.
  - Nothing interferes with the crane or the personnel platform in the course of the trial lift.
  - The lift will not exceed 50 percent of the crane's rated capacity at any time during the lift.
  - The load radius to be used during the lift has been accurately determined.
- Immediately after the trial lift, the competent person shall:
  - Conduct a visual inspection of the equipment, base support or ground, and personnel platform to determine whether the trial lift has exposed any adverse effect.
  - Confirm the test weight has been removed upon the completion of the trail lift.
- Immediately prior to each lift:
  - Hoist the platform a few inches and have it inspected by a competent person to confirm that it is secure and properly balanced.
  - The following conditions shall be determined to exist by a competent person before the lift of personnel proceeds:
    - Hoist ropes are free of deficiencies in accordance with this procedure.
    - Multiple part lines are not twisted around each other.
    - The primary attachment is centered over the platform.
    - If the load rope is slack, the hoisting system shall be inspected to confirm that all ropes are properly seated on drums and in sheaves.
- Any condition found during the trial lift and subsequent inspection(s) that fails to meet a requirement of this procedure or otherwise creates a safety hazard shall be corrected before hoisting personnel.

4.23.11 Proof testing

- At each jobsite, prior to hoisting workers on the personnel platform, and after any repair or modification, the platform and rigging shall be proof-tested to 125 percent of the platform's rated capacity. The proof test may be done concurrently with the trial lift.
- The platform shall be lowered by controlled load lowering; braked; and held in a suspended position for a minimum of
- 5 minutes with the test load evenly distributed on the platform.
- After proof testing, a competent person shall inspect the platform and rigging to determine if the test has been passed. If any deficiencies are found that pose a safety hazard, the platform and rigging cannot be used to hoist personnel unless the deficiencies are corrected; the test is repeated; and a competent person determines that the test has been passed.

- Do not conduct personnel hoisting until the competent person determines that the platform and rigging have successfully passed the proof test.

4.23.12 Personnel Platform Lifting Procedures

- Personnel are only allowed to ride in a personnel platform supported by the crane load line attachment or boom-mounted platform when used in accordance with the requirements of jurisdictional regulations and standards, and the crane manufacturer's instructions. The crane may not be used for other purposes while handling personnel.
- When using equipment to hoist workers, the workers shall be in a personnel platform that meets the requirements of this proceudre.
- Do not load the personnel platform in excess of its rated capacity.
- Personnel platforms will be used only for workers, their tools, and the materials necessary to do their work. Platforms shall not be used to hoist materials or tools when not hoisting personnel.
- Exception: Materials and tools to be used during the lift, if properly secured and distributed may be placed in the platform for trial lifts.
- Materials and tools shall be:
    - Secured to prevent displacement.
    - Evenly distributed within the confines of the platform while it is suspended.
- The number of workers occupying the personnel platform will not exceed the maximum number the platform was designed to hold, or the number required to perform the work, whichever is less.
- Perform the hoisting of the personnel platform in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.
- Platform occupants shall:
    - Keep all parts of the body inside the platform during raising, lowering, and horizontal movement. This provision does not apply to an occupant of the platform when necessary to position the platform or while performing the duties of a signal person.
    - Not stand, sit on, or work from the top or intermediate rail or toe board, or use any other means/device to raise their working height.
    - Not pull the platform out of plumb in relation to the hoisting equipment.
- Before workers exit or enter a hoisted personnel platform that is not landed, the platform shall be secured to the structure where the work is to be performed, unless securing to the structure would create a greater hazard.
- If the platform is tied to the structure, the operator shall not move the platform until the operator receives confirmation that it is freely suspended.
- Use tag lines when necessary to control the platform.
- Environmental conditions.
    - Wind. When wind speed (sustained or gusts) exceeds 20 miles per hour (32 kilometers per hour) at the personnel platform, a qualified person shall determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation will not begin (or, if already in progress, will be terminated).
    - Other weather and environmental conditions. A qualified person shall determine if, in light of indications of dangerous weather conditions, or other impending or existing danger, it is

not safe will not begin (or, if already in progress, will be terminated).

- Workers being hoisted shall remain in direct communication with the signal person (where used), or the operator.
- Fall protection
  - Except over water, workers occupying the personnel platform shall be provided and use a personal fall arrest system. The system shall be attached to a structural member within the personnel platform.
  - The fall arrest system, including the attachment point (anchorage) shall meet the requirements of *S3AM-304-PR1 Fall Protection*.
- Other load lines
  - Do not make lifts on any other of the equipment's load lines while personnel are being hoisted, except in pile driving operations.
  - Factory-produced boom-mounted personnel platforms that incorporate a winch as original equipment: Loads are permitted to be hoisted by such a winch while workers occupy the personnel platform only where the load on the winch line does not exceed 500 pounds (227 kilograms), and does not exceed the rated capacity of the winch and platform.
- Traveling – Equipment other than derricks
  - Hoisting of workers while the equipment is traveling is prohibited.
- Traveling – Derricks.
  - Derricks are prohibited from traveling while personnel are hoisted.

4.23.13 Pre-lift meeting. A pre-lift meeting will be:

- Held to review the applicable requirements of this section and the procedures that will be followed, including the completed *S3AM-310-FM11 Personnel Platform Lifting* or equivalent.
- Attended by the equipment operator, signal person (if used for the lift), workers to be hoisted, and the person responsible for the task to be performed.
- Held prior to the trial lift at each new work location, and repeated for any workers newly assigned to the operation.

4.24 Floating Cranes/Derricks and Land Cranes/Derricks on Barges

4.24.1 This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels, or other means of flotation (vessel/flotation device). The requirements of this section do not apply when using jacked barges when the jacks are deployed to the river/lake/sea-bed, and the barge is fully supported by the jacks.

4.24.2 Additional Safety devices. In addition to the safety devices listed in this procedure, the following safety devices are required:

- Barge, pontoon, vessel, or other means of flotation list and trim device will be located in the cab; or, where there is no cab, at the operator's station.
- Horn.
- Positive equipment house lock.
- Wind speed and direction indicator. A competent person will determine if wind is a factor that needs to be considered; if so, a wind speed and direction indicator will be used.

4.24.3 Operational aids.

- An anti–two-block device is required only when hoisting personnel or hoisting over an occupied

cofferdam or shaft.

- Load weighing and similar devices (e.g., load moment (or rated capacity) indicator, load moment (or rated capacity) limiter, automatic overload prevention device, etc.) do not apply to dragline, clamshell (grapple), magnet, drop ball, container handling, concrete bucket, and pile driving equipment manufactured prior to November 8, 2011.

4.24.4 Accessibility of procedures applicable to equipment operation. If the crane/derrick has a cab, the requirements of this procedure apply. If the crane/derrick does not have a cab:

- Rated capacities (load charts) shall be posted at the operator's station. If the operator's station is moveable (such as with pendant-controlled equipment), the load charts shall be posted on the equipment.
- Procedures applicable to the operation of the equipment (other than load charts), recommended operating speeds, special hazard warnings, instructions and operators manual, shall be readily available on board.

4.24.5 Inspections. In addition to meeting the requirements of this procedure for inspecting the crane/derrick, the manager (or his/her designee) shall confirm that the barge, pontoons, vessel, or other means of flotation used to support a floating crane/derrick or land crane/derrick is inspected as follows:

- Shift. The means used to secure/attach the equipment to the vessel/flotation device shall be inspected for wear, corrosion, loose or missing fasteners, defective welds, and, where applicable, insufficient tension.
- Monthly. Inspect the vessel/flotation device used as follows:
  - The means used to secure/attach the equipment to the vessel/flotation device shall be inspected for wear, corrosion, loose or missing fasteners, defective welds, and, where applicable, insufficient tension.
  - Evidence of taking on water.
  - Deck load for proper securing.
  - Chain lockers, storage, fuel compartments and battening of hatches for serviceability as a water-tight appliance.
  - Firefighting and lifesaving equipment in place and functional.
- The shift and monthly inspections shall be conducted by a competent person. If any deficiency is identified, an immediate determination will be made by a qualified person as to whether the deficiency constitutes a hazard. If the deficiency is determined to constitute a hazard, the vessel/floatation device shall be removed from service until it has been corrected.
- Annual: External vessel/flotation device inspection.
  - The external portion of the barge, pontoons, vessel, or other means of flotation used shall be inspected annually by a qualified person who has expertise with respect to vessels/flotation devices. The inspection shall include the following items:
    - The items identified in requirements of this section.
    - Cleats, bitts, chocks, fenders, capstans, ladders, and stanchions for significant corrosion, wear, deterioration, and deformation.
    - External evidence of leaks and structural damage.
    - Four-corner draft readings.
    - Firefighting equipment for serviceability.

- Rescue skiffs, lifelines, work vests, life preservers and ring buoys shall be inspected for proper condition.
- If any deficiency is identified, an immediate determination will be made by the qualified person as to whether the deficiency constitutes a hazard; or, although not yet a hazard, needs to be monitored in the monthly inspections. If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.
- If the qualified person determines that, although not currently a hazard, the deficiency needs to be monitored, the manager (or his/her designee) shall confirm that the deficiency is checked in the monthly inspections.

- Quadrennial: Internal vessel/flotation device inspection:
  - The internal portion of the barge, pontoons, vessel, or other means of flotation used shall be surveyed once every 4 years by a marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices.
  - If any deficiency is identified, an immediate determination will be made by the surveyor as to whether the deficiency constitutes a hazard; or, although not yet a hazard, needs to be monitored in the monthly inspections as appropriate.
  - If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.
  - If the surveyor determines that, although not currently a hazard, the deficiency needs to be monitored, the manager (or his/her designee) shall confirm that the deficiency is checked in the monthly or annual inspections as appropriate.
- Documentation. The required monthly, annual and quadrennial inspections shall be documented in accordance with this procedure. The quadrennial inspection shall be retained for a minimum of 4 years.

4.24.6 Working with a diver. The following additional requirements apply when working with a diver in the water:

- If a crane/derrick is used to get a diver into and out of the water, it cannot be used for any other purpose until the diver is back on board. When used for more than one diver, it cannot be used for any other purpose until all divers are back on board.
- The operator shall remain at the controls of the crane/derrick at all times.
- In addition to the signal requirements in this procedure; either:
  - A clear line of sight shall be maintained between the operator and tender of the diver, or
  - The signals between the operator and tender of the diver shall be transmitted electronically.
- The means used to secure the crane/derrick to the vessel/flotation device cannot allow any amount of shifting in any direction.

4.24.7 The manager (or his/her designee) shall confirm that the manufacturer's specifications and limitations with respect to environmental, operational, and in-transit load for the barge, pontoons, vessel, or other means of flotation are not exceeded or violated.

4.24.8 Floating cranes/derricks. For equipment designed by the manufacturer (or manager or his/her designee) for marine use by permanent attachment to barges, pontoons, vessels, or other means of flotation:

- Load Charts

- The manufacturer's load charts applicable to operations on water cannot be exceeded. When using these charts, the manager (or his/her designee) shall comply with all parameters and limitations (such as dynamic/environmental parameters) applicable to the use of the charts.
- The load charts will take into consideration a minimum wind speed of 40 miles per hour (64 kilometers per hour).

- The requirements for maximum allowable list and maximum allowable trim as specified below shall be met.

Rated Capacity	Maximum Allowable List	Maximum Allowable Trim
Equipment designed for marine use by permanent attachment (other than derricks):		
25 tons or less	5 degrees	5 degrees
Over 25 tons	7 degrees	7 degrees
Derricks designed for marine use by permanent attachment:		
Any rated capacity	10 degrees	10 degrees

- If the equipment is manager (or his/her designee)-made, it is not permitted to be used unless the manager (or his/her designee) has documents demonstrating that the load charts and applicable parameters for use meet the requirements of this section. Such documents shall be signed by a registered professional engineer who is a qualified person with respect to the design of this type of equipment (including the means of flotation).
- The barge, pontoons, vessel, or other means of flotation used shall:
  - Be structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derricks' maximum-rated capacity with all anticipated deck loads and ballasted compartments.
  - Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free-surface effect.
  - Have access to void compartments to allow for inspection and pumping.

4.24.9 Land cranes/derricks. For land cranes/derricks used on barges, pontoons, vessels, or other means of flotation:

- The rated capacity of the equipment (load charts) applicable for use on land shall be reduced to:
  - Account for increased loading from list, trim, wave action, and wind.
  - Be applicable to a specified location(s) on the specific barge, pontoons, vessel, or other means of flotation that will be used, under the expected environmental conditions.
- The rated capacity modification shall be done by the equipment manufacturer, or a qualified person who has expertise with respect to both land crane/derrick capacity, and the stability of vessels/flotation devices.
- List and trim.
  - The maximum allowable list and the maximum allowable trim cannot exceed the least of the following: 5 degrees, the amount specified by the crane/derrick manufacturer; or, where an amount is not so specified, the amount specified by the qualified person.
  - The maximum allowable list and the maximum allowable trim for the barge, pontoon,

vessel, or other means of flotation cannot exceed the amount necessary to confirm that following conditions are met:

- All deck surfaces of the barge, pontoons, vessel, or other means of flotation used shall be above water.
- The entire bottom area of the barge, pontoons, vessel, or other means of flotation used shall be submerged.

- Physical attachment, corralling, rails system, and centerline cable system. The manager (or his/her designee) shall meet the requirements in Option 1, Option 2, Option 3, or Option 4, as follows.
  - Option 1 – Physical attachment. The crane/derrick shall be physically attached to the barge, pontoons, vessel, or other means of flotation. Methods of physical attachment include crossed-cable systems attached to the crane/derrick and vessel flotation device (this type of system allows the crane/derrick to lift up slightly from the surface of the vessel/means of flotation), bolting or welding the crane/derrick to the vessel/flotation device, strapping the crane/derrick to the vessel/flotation device with chains, or other methods of physical attachment.
  - Option 2 – Corralling. The crane/derrick shall be prevented from shifting by installing barricade restraints (a corralling system). Corralling systems shall not allow any amount of shifting in any direction by the equipment.
  - Option 3 – Rails. The crane/derrick shall be prevented from shifting by being mounted on a rail system. Rail clamps and rail stops are required unless the system is designed to prevent movement during operation by other means.
  - Option 4 – Centerline cable system. The crane/derrick shall be prevented from shifting by being mounted to a wire rope system. The wire rope system shall meet the following requirements:
    - The wire rope and attachments shall be of sufficient size/strength to support the side load of crane/derrick.
    - The wire rope shall be physically attached to the vessel/flotation device.
    - The wire rope shall be attached to the crane/derrick by appropriate attachment methods (such as shackles or sheaves) on the undercarriage, which will allow the crew to secure the crane/derrick from movement during operation, and to move the crane/derrick longitudinally along the vessel/flotation device for repositioning.
    - A method will be employed to prevent the crane/derrick from passing the forward or aft end of the wire rope attachments.
    - The crane/derrick shall be secured from movement during operation.
  - Whichever Option is used, the systems/means used to comply with the Option will be designed by a marine engineer, registered professional engineer familiar with floating crane/derrick design, or qualified person familiar with floating crane/derrick design.
  - Exception. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement to use Option 1, Option 2, Option 3, or Option 4 of this section does not apply where the manager (or his/her designee) demonstrates implementation of a plan and procedures that meet the following requirements:
    - A marine engineer or registered professional engineer familiar with floating crane/derrick design develops and signs a written plan for the use of the mobile auxiliary crane.
    - The plan shall be designed so that the applicable requirements of this section will be

met despite the position, travel, operation, and lack of physical attachment (or corralling, use of rails, or cable system) of the mobile auxiliary crane.

- The plan shall specify the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate, and the parameters/limitations of such movement and operation.
- The deck shall be marked to identify the permitted areas for positioning, travel, and operation.
- The plans all specify the dynamic/environmental conditions that shall be present for use of the plan. If the specified dynamic/environmental conditions are exceeded, the mobile auxiliary crane shall be physically attached or corralled in accordance with Option 1, Option 2, Option 3, or Option 4.

- The barge, pontoons, vessel, or other means of flotation used shall:
  - Be structurally sufficient to withstand the static and dynamic loads of the crane/derrick when operating at the crane/derrick's maximum rated capacity with all anticipated deck loads and ballasted compartments.
  - Have a subdivided hull with one or more longitudinal watertight bulkheads for reducing the free surface effect.
  - Have access to void compartments to allow for inspection and pumping.

4.25 Dedicated pile drivers.

4.25.1 The provisions of this procedure apply to dedicated pile drivers, except as specified in this section.

4.25.2 Information provided elsewhere in this standard on anti two-block devices does not apply.

4.25.3 Operator Qualification and Certification applies, except that the qualification or certification will be for operation of either dedicated pile drivers, or equipment that is the most similar to dedicated pile drivers.

4.25.4 The industrial site or project specific SH&E Plan shall include minimum safe work distances for workers adjacent to all pile driving operations.

- At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.

4.26 Overhead and Gantry Cranes

4.26.1 The requirements of this procedure apply to the following equipment when used in construction: Overhead and gantry cranes, including semi-gantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics.

4.27 Derricks

4.27.1 This section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this procedure apply to derricks unless specified otherwise. A derrick is powered equipment consisting of a mast or equivalent member that is held at or near the end by guys or braces, with or without a boom, and its hoisting mechanism. The mast/equivalent member and/or the load are moved by the hoisting mechanism (typically base-mounted) and operating ropes. Derricks include A-frame, basket, breast, Chicago boom, gin pole (except gin poles used for erection of communication towers), guy, shear leg, and variations of such equipment.

4.27.2 Operation of Derricks

- "Operation" applies except for "accessibility of procedures".

- Load chart contents. Load charts shall contain at least the following information:
  - Rated capacity at corresponding ranges of boom angle or operating radii.
  - Specific lengths of components to which the rated capacities apply.
  - Required parts for hoist reeving.
  - Size and construction of rope will be included on the load chart or in the operating manual.
- Load chart location.
  - Permanent installations. For permanently installed derricks with fixed lengths of boom, guy, and mast, a load chart shall be posted where it is visible to personnel responsible for the operation of the equipment.
  - Non-permanent installations. For derricks that are not permanently installed, the load chart shall be readily available at the job site to personnel responsible for the operation of the equipment.

4.27.3 Construction of Derricks

- General requirements
  - Derricks shall be constructed to meet all stresses imposed on members and components when installed and operated in accordance with the manufacturer's/builder's procedures, and within its rated capacity.
  - Welding of load-sustaining members shall conform to recommended practices of the applicable jurisdictional standard (e.g. ANSI, CSA).
- Guy derricks.
  - The minimum number of guys will be six, with equal spacing, except where a qualified person or derrick manufacturer approves variations from these requirements and revises the rated capacity to compensate for such variations.
  - Guy derricks will not be used unless the manager (or his/her designee) has the following guy information:
    - The number of guys.
    - The spacing around the mast.
    - The size, grade, and construction of rope to be used for each guy.
  - For guy derricks manufactured after December 18, 1970 the manager (or his/her designee) shall have the following additional guy information:
    - The amount of initial sag or tension.
    - The amount of tension in guy line rope at anchor.
  - The mast base shall permit the mast to rotate freely, with allowance for slight tilting of the mast caused by guy slack.
  - The mast cap shall:
    - Permit the mast to rotate freely.
    - Withstand tilting and cramping caused by the guy loads.
    - Be secured to the mast to prevent disengagement during erection.
    - Be provided with means for attaching guy ropes.
- Stiff leg derricks.

- The mast will be supported in the vertical position by at least two stiff legs: one end of each will be connected to the top of the mast, and the other end securely anchored.
- The stiff legs shall be capable of withstanding the loads imposed at any point of operation within the load chart range.
- The mast base shall:
  - Permit the mast to rotate freely (when necessary).
  - Permit deflection of the mast without binding.
- The mast shall be prevented from lifting out of its socket when the mast is in tension.
- The stiff leg connecting member at the top of the mast shall:
  - Permit the mast to rotate freely (when necessary).
  - Withstand the loads imposed by the action of the stiff legs.
  - Be secured so as to oppose separating forces.

- Gin pole derricks.
  - Guy lines shall be sized and spaced so as to make the gin pole stable in both boomed and vertical positions. Exception: Where the size and/or spacing of guy lines do not result in the gin pole being stable in both boomed and vertical positions, the manager (or his/her designee) shall confirm that the derrick is not used in an unstable position.
  - The base of the gin pole shall permit movement of the pole (when necessary).
  - The gin pole shall be anchored at the base against horizontal forces (when such forces are present).
- Chicago boom derricks. The fittings for stepping the boom and for attaching the topping lift shall be arranged to:
  - Allow the derrick to swing at all permitted operating radii and mounting heights between fittings.
  - Accommodate attachment to the upright member of the host structure.
  - Withstand the forces applied when configured and operated in accordance with the manufacturer's/builder's procedures, and within its rated capacity.
  - Prevent the boom or topping lift from lifting out under tensile forces.

4.27.4 Anchoring and guying of derricks

- Load anchoring data developed by the manufacturer or a qualified person shall be used.
- Guy derricks.
  - Anchor the mast base.
  - Secure the guys to the ground or other firm anchorage.
  - Design the anchorage and guying to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application.
- Stiff Leg derricks.
  - Anchor the mast base and stiff legs.
  - Design the anchorage and guying to withstand maximum horizontal and vertical forces encountered when operating within rated capacity with the particular stiff leg spacing and

slope specified for the application.

4.27.5 Swingers and hoists

- The boom, swinger mechanisms, and hoists shall be suitable for the derrick work intended, and shall be anchored to prevent displacement from the imposed loads.
- Base-mounted drum hoists.
  - Base-mounted drum hoists shall meet the requirements specified by the applicable jurisdictional regulations and/or standards.
  - Load tests for new hoists. The manager (or his/her designee) shall confirm that new hoists are load tested to a minimum of 110 percent of rated capacity, but not more than 125 percent of rated capacity, unless otherwise recommended by the manufacturer. This requirement is met where the manufacturer has conducted this testing.
  - Repaired or modified hoists. Hoists that have had repairs, modifications, or additions affecting their capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary.
  - Load test procedure. Required load tests shall be conducted as follows:
    - Hoist the test load a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s).
    - The test load will be lowered, stopped, and held with the brake(s).
    - Do not use the hoist unless a competent person determines that the test has been passed.

4.27.6 Operational Aids for derricks

- Operational Aids requirements identified in this procedure apply, except for “Boom hoist limiting device” and “Boom angle or radius indicator” and “Load weighing and similar devices.”
- Boom angle aid. The manager (or his/her designee) shall confirm that either:
  - The boom hoist cable is marked with caution and stop marks. The stop marks correspond to maximum and minimum allowable boom angles. The caution and stop marks are in view of the operator, or a spotter who is direct communication with the operator; or
  - An electronic or other device that signals the operator in time to prevent the boom from moving past its maximum and minimum angles, or automatically prevents such movement, is used.
- Load weight/capacity devices. Derricks manufactured more than 1 year after November 8, 2010 with a maximum rated capacity over 6,000 pounds shall have at least one of the following: load weighing device, load moment indicator, rated capacity indicator, or rated capacity limiter. Temporary alternative measures: the weight of the load shall be determined from a reliable source (such as the load’s manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per-foot weight), or by other equally reliable means. This information will be provided to the operator prior to the lift.

4.27.7 Post-assembly approval and testing – new or reinstalled derricks

- Anchorages
  - Anchorages, including the structure to which the derrick is attached (if applicable), shall be approved by a qualified person.
  - If using a rock or hairpin anchorage, the qualified person shall determine if any special testing of the anchorage is needed. If so, it will be tested accordingly.

- Functional test. Prior to initial use, new or reinstalled derricks shall be tested by a competent person with no hook load to verify proper operation. This test shall include:
  - Lifting and lowering the hook(s) through the full range of hook travel.
  - Raising and lowering the boom through the full range of boom travel.
  - Swinging in each direction through the full range of swing.
  - Actuating the anti–two-block and boom-hoist–limit devices (if provided).
  - Actuating locking, limiting, and indicating devices (if provided).
- Load test. Prior to initial use, new or reinstalled derricks shall be load tested by a competent person. The test load shall meet the following requirements:
  - Test loads shall be at least 100 percent, and no more than 110 percent, of the rated capacity, unless otherwise recommended by the manufacturer or qualified person, but in no event shall the test load be less than the maximum anticipated load.
  - The test shall consist of:
    - Hoisting the test load a few inches and holding to verify that the load is supported by the derrick and held by the hoist brake(s).
    - Swinging the derrick, if applicable, the full range of its swing, at the maximum allowable working radius for the test load.
    - Lowering, stopping, and holding the load with the brake(s).
  - The derrick is not permitted to be used unless the competent person determines that the test has been passed.
- Documentation. Tests conducted under this paragraph will be documented. The document will be retained until the derrick is re-tested or dismantled, whichever occurs first.

4.27.8 Load testing repaired or modified derricks. Derricks that have had repairs, modifications for additions affecting the derrick's capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing shall be conducted and documented.

4.27.9 Power failure procedures. If power fails during operations, the derrick operator shall safely stop operations. This includes:

- Setting all brakes or locking devices.
- Moving all clutch and other power controls to the off position.

4.27.10 Use of winch heads

- Do not handle ropes on a winch head without the knowledge of the operator.
- While a winch head is being used, the operator shall be within reach of the power unit control lever.

4.27.11 Securing the boom

- When the boom is being held in a fixed position, engage dogs, pawls, or other positive holding mechanisms on the boom hoist.
- When taken out of service for 30 days for more, secure the boom by one of the following methods:
  - Lay it down.
  - Secure it to a stationary member, as nearly under the head as possible, by attachment of a sling to the load block.

- For guy derricks, lift to a vertical position and secure to the mast.
- For stiff leg derricks, secure against the stiff leg.

4.27.12 The process of jumping the derrick shall be supervised by the A/D supervisor.

4.27.13 Derrick operations shall be supervised by a competent person.

4.27.14 Inspections. In addition to the requirements in this procedure, the following additional items shall be included in the inspections of derricks:

- Daily: Guys for proper tension.
- Annual:
  - Gudgeon pin for cracks, wear, and distortion.
  - Foundation supports for continued ability to sustain the imposed loads.

4.28 Side-Boom Cranes and Boom-Truck Procedures

4.28.1 Prior to the manipulation of any controls, operators are to confirm that all personnel are clear of all moving parts.

4.28.2 The operator is in control of all operations associated with side-boom crane or boom truck.

4.28.3 The boom truck operator shall confirm the THA and boom truck hazard checklist have been performed and reviewed and signed by all parties prior to working with boom truck. Refer to *S3AM-310-FM10 Boom Truck Checklist*.

4.28.4 Only approved access and egress points on/off the bed of the truck shall be used.

4.29 Equipment with Rated Hoisting/Lifting Capacity of 2,000 pounds (907 kilograms) or less.

4.29.1 The manager shall confirm the operator is trained and competent to operate lifting equipment.

4.29.2 Proper planning shall be conducted, including, but not limited to:

- Complete a THA for the proposed task.
- Inspect the lifting equipment pre-operation and in accordance with manufacturer specifications.
- Accurately establish load weight, including rigging equipment, and confirming it is within the lifting capacity of the lifting equipment.
- Assess weather conditions for potential impacts and ground conditions for stability and levelness.
- As applicable, select appropriate wire rope, install properly and inspect according to this procedure.
- Verify the presence of and proper operation of manufacturer supplied safety devices.
- Adequately identify work area to prevent unauthorized entry.
- Where overhead power lines are present, conduct operations in accordance with this procedure.

4.29.3 Operators shall comply with all the manufacturer's procedures applicable to the operational functions of equipment, including its use with attachments.

5.0 Records

5.1 All training records shall be maintained in accordance with *S3AM-003-PR1 SH&E Training*.

5.2 All inspection records will be maintained on site with the machine. This will include, but not be limited to:

- Equipment inspections;

- Equipment tests; and
- Repairs, modifications and/or maintenance of the lifting device.

5.3 Critical Lift Plans, signed off Assembly – Disassembly Procedures, Lift Classifications and any other documentation completed relating to the lifting tasks shall be maintained in the program or project files.

6.0 Attachments

6.1 S3AM-310-ATT1 Definitions

6.2 S3AM-310-ATT2 Standard Hand Signals

6.3 S3AM-310-ATT3 Rigging

6.4 S3AM-310-ATT4 Wire Rope Safety Factors

6.5 S3AM-310-FM1 Initial & Annual Crane Inspection

6.6 S3AM-310-FM2 Lift Classification

6.7 S3AM-310-FM3 Critical Lift Plan

6.8 S3AM-310-FM4 Daily Crane Inspection

6.9 S3AM-310-FM5 Monthly Crane Inspection

6.10 S3AM-310-FM6 Monthly Wire Rope / Hook Inspection

6.11 S3AM-310-FM7 Monthly Synthetic Sling Inspection

6.12 S3AM-310-FM8 Monthly Shackle Inspection

6.13 S3AM-310-FM9 Monthly Rigging Inspection

6.14 S3AM-310-FM10 Boom Truck Checklist

6.15 S3AM-310-FM11 Personnel Platform Lifting

6.16 S3AM-310-FM12 Assembly – Disassembly Procedure

Attachment 12.

Portland Harbor PDI Studies, 2018

Fish Acoustics Tracking Study Project- Specific HASP Addendum

Field Crew Initials:

Safety Inspection Form: Electronarcosis

Principle Activities	Control Measure	Yes/No?
1- Initial System Setup	Is the power supplied to the DC power supply away from the surgery area?	☐
2- Initial System Setup	Is the power supply powered by 120 V AC line power, or an AC/DC inverter from a 12 V DC battery?	☐
3- Initial System Setup	Are wire connections to the power supply elevated and away from the surgery area?	☐
4- Initial System Setup	Is the line power or inverter unit off when connections and plug-ins are made?	☐
5- Initial System Setup	If DC power supply is powered by line power, is a GFCI outlet installed for line power?	☐
6- Surgery Process	Is the electronarcosis unit powered off before the surgery process begins?	☐
7- Surgery Process	Is the voltage gradually increased, only until the electronarcosis effect is achieved?	☐
8- Surgery Process	While the power supply has a read out of the voltage level, is a separate hand-held Digital Volt Meter (DVM) being used to confirm the voltage level supplied directly to the electronarcosis unit's plates?	☐